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FEBRUARY 1949 • VOLUME 38 • NUMBER 2

THIOPENTAL SODIUM IN THE PRACTICE OF ORAL SURGERY

Stewart Everson, D.D.S., Los Angeles

THE ease of intravenous administration of anesthetics is unparalleled by any other method. Undoubtedly this accounts for the wide usage and credit it so rightly has received and, conversely, for the disapproval of some practitioners.[1] Too many who have not the qualifications to administer any kind of anesthetic have been tempted to employ the seemingly simple technic of injecting a few cubic centimeters of a barbiturate into a vein. Good luck for a time may confirm the belief that this is surely the best and most convenient of all anesthetic technics, and the inexperienced administrator will become foolhardy and indiscriminate in direct proportion to his good luck. Obviously such folly can result, ultimately, in nothing but disaster. As with other general anesthetics, the barbiturates have no place in the hands of unskilled administrators.

After reviewing the literature on the use of thiopental sodium (Pentothal Sodium) for intravenous anesthesia, I have deduced that the censure of this form of anesthetic is the result of disregard of the dangers that accompany its injudicious use. Disapproval is directly traceable to lack of proper judgment by the anesthetist rather than to faults of the anesthetic.[2] Adverse criticism is justified only if it does not result in condemnation of the anesthetic itself, for when it is used intelligently it has unquestionable worth and a unique place among anesthetic agents.

I do not wish to minimize the dangers attending the use of thiopental sodium, but at the same time I do not wish to magnify them to such an extent that it will be subordinated to other general anesthetics. Each difficulty that may arise during the administration may be overcome if handled with proper skill and intelligence.

During the years I have been using thiopental sodium I have not encountered a serious mishap. If "good luck" must be acknowledged, I shall say that luck has been on my side only because

1. Pleasance, R. E., Intravenous Anaesthesia. *M. Press* 216:467 (Dec. 18) 1946.

2. Adams, R. C.; Lundy, J. S., and Seldon, T. H., Ten Years of Pentothal Sodium Intravenous Anesthesia; an Evaluation of Its Past, Present and Future. *Anesthesiology* 8:239 (May) 1945.

I have, at all times, exercised what I believed to be good judgment, have abided by the rules applicable to all general anesthetics, and have not belittled the inherent dangers of thiopental sodium.

Contraindications

It is absolutely imperative that a history of the patient be obtained before the administration of thiopental sodium. There are many contraindications, some relative and a few absolute. The most common ones are:

1. Any serious interference with respiratory function, especially if there is mechanical obstruction of the respiratory passages.

2. Chronic pulmonary disease characterized by production of large amounts of sputum,[3] such as bronchitis and bronchiectasis. The hazard of respiratory obstruction or laryngospasm from such secretions is great.

3. Serious cardiac disease, especially where there is congestive failure, angina pectoris or any other evidence of disease of the coronary artery.

4. Any debilitating condition, such as chronic illness, severe anemia or any other disorder that might make the patient a poor risk for any type of general anesthesia.

5. Structural abnormalities, such as ankylosis of the jaws, which might interfere with proper access to the mouth and pharynx.

6. Patients with systolic blood pressures over 200 mm.[4] or under 90 mm.[5] of mercury.

7. Very young or very old patients.

Under no circumstances, except possibly in extreme emergency, should a patient be given an intravenous anesthetic if he has partaken of food or drink within the preceding four hours. Vomiting and aspiration of the vomitus are serious hazards, difficult to manage, and serious pulmonary complication or fatality may result.[6]

Nitrous Oxide as a Supplement

In my practice, nitrous oxide frequently is used as a supplement to thiopental sodium. These anesthetics are used together rather than individually because one counteracts the bad effects of the other, allowing each to act with optimal efficiency.[7] By combining the good effects of both, the undesirable effects are minimized. A nitrous oxide-oxygen mixture is administered primarily to afford an atmosphere with increased oxygen tension, and secondarily to obtain the weak anesthetic effect of a low nitrous oxide percentage which, in turn, reduces the amount of the barbiturate required.[8]

Nitrous oxide-oxygen alone has a narrow range of usefulness, and in most instances the amount of oxygen must be lowered to somewhat dangerous levels in order to obtain deep anesthesia; this, perhaps, might be termed suffocation rather than anesthesia. Thiopental sodium alone is a depressant with a cumulative effect. Therefore, neither anesthetic is advocated for procedures that may require more than an hour. However, when one is used as an adjunct to the other, the operation may be prolonged for hours if the anesthetics are administered in correct proportions. Thiopental sodium, with or without nitrous oxide, produces relaxation of the masseter muscle,[9] whereas nitrous oxide alone fre-

3. Krueger, V. R., Pentothal Sodium Anaesthesia for the Tuberculous Patient. *Am. Rev. Tuberc.* 47:51 (Jan.) 1943.

4. Johns, W. S., Intravenous Anaesthesia. *Canad. M. A. J.* 43:292 (March) 1943.

5. Lucas, G. H. W., Pharmacology of Some Anaesthetic Drugs. *Bull. Acad. Med., Toronto* 18:93 (Feb.) 1945.

6. Moore, R. H., Inhalation of Food During Injection of Pentothal. *Bristol Med.-Chir. J.* 63:82 (Summer) 1946.

7. Hand, J. P., Jr., An Analysis of the Use of Pentothal in Seven Thousand Four Hundred Anesthetics. *M. Ann. District of Columbia* 14:496 (Nov.) 1945.

8. Helfman, H., Sodium Pentothal Combined Anesthesia. *Ohio State M. J.* 42:373 (April) 1946.

9. Lundy, J. S.; Adams, R. C., and Seldon, T. H., Intravenous Administration of an Anesthetic Agent: a Comparison of the Technic for Robust Patients and for Patients in Shock. *U. S. Nav. M. Bull.* 42:11 (Jan.) 1944.

quently fails in this respect and, indeed, trismus of the jaw is not a rare accompaniment.

Technic

A 2 per cent solution of thiopental sodium is better than more concentrated solutions because in the event that extravascular injection occurs, there is no postoperative discomfort[10] and the danger of venous thrombosis and sloughing of tissues is less.

Venipuncture is performed on any convenient vein of the antecubital space, forearm, wrist or hand. An initial injection of 10 cc. of thiopental sodium solution, containing atropine, 1/150 to 1/100 grain (0.4 mg. to 0.6 mg.), is administered by means of a 10 cc. syringe. The induction dosage must be given slowly.[11] A 30 cc. syringe is then connected to the same needle by means of a 7 inch length of rubber tubing and a glass adapter. This facilitates the administration of additional thiopental sodium and allows the anesthetist freedom in administering oxygen or nitrous oxide-oxygen mixture, and in observing and attending the patient's airway.

If, at any time during the administration of the first 5 or 6 cc. of the anesthetic, the patient's breathing becomes shallow or the pulse becomes irregular or weak, this is an indication that the patient is not tolerating the drug normally and extreme care must be taken in the administration of any additional amount. If the patient reacts normally by slowly losing consciousness and if he exhibits no danger signals denoting respiratory or circulatory difficulties, he may be anesthetized completely with thiopental sodium.

As soon as the initial 10 cc. of thiopental sodium have been given, nitrous oxide-oxygen is administered in a proportion of 25 per cent oxygen to 75 per cent nitrous oxide. This may be changed to 20 per cent oxygen and 80 per cent nitrous oxide if further administration of thiopental sodium is not desired or if the operation is nearing completion.

The dosage of thiopental sodium varies with the individual patient and the length of the operative procedure. Since the amount of anesthetic required under normal conditions is in proportion to the metabolic rate, young patients have a higher tolerance and require greater amounts of the drug than elderly patients.[12] Apprehensive patients and those accustomed to heavy alcoholic intake generally require more anesthetic than the average person.

Dilation of the pupils, increased respirations, movement on the part of the patient and wrinkling of the brow are indications for administration of additional thiopental sodium;[13] 1 to 2 cc., or more, may be given.

Recovery Time

The recovery time is variable. In the majority of instances, patients recover and are able to go home within 45 minutes.[14] The time required may be as short as half an hour, but in rare cases recovery may take as long as two or three hours. In any case, the use of thiopental sodium for office surgery requires several recovery rooms and a reliable nurse to care for the patients during the recovery period.

Delayed recovery is not, apparently, a direct function of dosage, age or weight. It has been observed, however, that patients with moderate hypotension have longer recovery periods than those with systolic blood pressures of 100 mm. of mercury or more.

10. Stallcup, L. B., Pentothal Sodium Anesthesia Using Automatic Control Syringe Method. *J. Oral Surg.* 4:1 (Jan.) 1946.
11. Gould, R. B., Intravenous Anesthesia in War Surgery. *Anesth. & Analg.* 25:115 (May-June) 1946.
12. Holly, J. D., Pentothal Sodium in Major Surgical Procedures. *Am. J. Surg.* 62:13 (Oct.) 1943.
13. Etsten, B., and Himwich, H. E., Stages and Signs of Pentothal Anesthesia: Physiologic Basis. *Anesthesiology* 7:536 (Sept.) 1946.
14. Bullard, O. K., and Brockett, S. I., Combined Pentothal Sodium-Nitrous Oxide-Oxygen Anesthesia in Oral Surgery. *J. Oral Surg.* 3:138 (April) 1945.

The patient must not be permitted to leave the office until he has regained his mental and physical equilibrium. It should be emphasized that after thiopental sodium anesthesia patients must be accompanied from the office by another person, as they generally suffer from varying degrees of intoxication which may render judgment poor; under no circumstances should the patient be permitted to drive an automobile.

Complications

The predominant cause for censuring thiopental sodium for use in oral surgery is the likelihood of laryngospasm. Thiopental sodium intensifies all vagal reflexes, particularly the motor reflexes of the larynx. Therefore, during anesthesia any laryngeal irritation may suffice to elicit laryngospasm which may be severe and distinctly dangerous unless the condition is relieved promptly.

Failure to attain and maintain adequate depth of anesthesia before starting an operation is the most common cause of laryngospasm. If anesthesia is obviously light, laryngospasm may be relieved by the administration of further small amounts of the anesthetic agent. The intensity of the laryngeal reflexes is greatest during light anesthesia and is markedly decreased by deep anesthesia. However, the reflexes cannot always be eliminated completely even at the maximum depth of anesthesia which may be induced safely.

The initiating factors of laryngospasm are many, the most obvious being direct irritation of the pharynx by foreign material[15] such as blood, mucus, artificial airways and gauze packs. The throat should be packed properly to prevent the aspiration of blood and saliva, care being taken that the tongue is not pushed against the posterior wall of the oropharynx, cutting off the airway.

Laryngospasm must be differentiated from pharyngeal obstruction to the airway. The former is commonly characterized by phonation and crowing, whereas pharyngeal obstruction is either silent or stertorous in character. Laryngospasm may, however, be silent, particularly when it is so severe as to result in complete or nearly complete respiratory obstruction, and also in instances where respiratory effort is depressed, a situation which not infrequently obtains during thiopental sodium anesthesia.

To relieve laryngospasm the offending cause must be removed. Oxygen should be forced through the narrowed glottis under pressure,[16] for in many instances the larynx will relax as soon as adequate oxygenation has been established.

Laryngospasm of severity sufficient to require endotracheal intubation is, fortunately, rare. However, anyone who undertakes the administration of thiopental sodium for any procedure, particularly operations on the mouth and face, must not only have in his possession a laryngoscope and proper endotracheal equipment, but must be skilled in the proper use of these instruments.

Atropine is truly a requisite to safe, smooth induction of anesthesia. Acting in a twofold manner by decreasing the severity of laryngeal reflexes and by diminishing the output of serous and mucous secretions,[17] it is indispensable.

Respiration is sometimes, although rarely, depressed to a dangerous degree. Respiratory depression is nearly always caused by overdosage.[18] Since the depth of anesthesia is a reflection of the concentration of barbiturate in the brain, the speed of administration is of great significance. With too rapid administration, a high concentration of

15. Hayes, Clifford, Intravenous Pentothal as the Sole Anesthetic for Tonsillectomy. *Proc. Roy. Soc. Med.* 39:633 (Aug.) 1946.

16. Hampson, L. M., Sodium Pentothal in Major Orthopaedic Surgery. *Canad. M. A. J.* 53:25 (July) 1945.

17. Lundy, J. S., and Tuohy, E. B., Newer Trends in Intravenous Anesthesia. *Minnesota Med.* 26:349 (April) 1943.

18. Skewis, J. E., Anesthesia. *Hosp. Corps Quart.* (no. 12) 18:23 (Dec.) 1945.

anesthetic may be present in the blood supply of the brain within a matter of seconds, resulting in respiratory depression and even in cessation of respiration. When this occurs during induction, the administration of the drug should be interrupted. Respiration will generally become re-established within thirty seconds, but if not, oxygen may be administered by careful intermittent positive pressure until spontaneous respiration is resumed. Additional amounts of the drug should then be given with caution until depth of anesthesia is attained which is adequate for the surgical procedure.

Although thiopental sodium is rapidly detoxified, primarily in the blood stream and secondarily in the liver, there is a cumulative effect. As the period of anesthesia lengthens, the patient becomes more sensitive to the drug and a few additional cubic centimeters of solution may cause severe respiratory depression.[19] Again, if respiratory failure occurs, oxygen should be supplied and artificial respiration instituted, if necessary.[20] If the pulse remains good, indicating that circulation is adequate, this treatment will suffice and spontaneous respiration will be initiated within the few minutes required for detoxification of a portion of the thiopental sodium.

A weak pulse and pale skin indicate that circulation has been seriously depressed by effects of the drug on vasomotor centers, in which event a stimulating drug is indicated. Picrotoxin (3 mg. per cc.) and pentamethylenetetrazol (Metrazol) (0.1 Gm. per cc.) are highly recommended for this purpose; 3 to 5 cc. of one or the other, administered intravenously, has proved satisfactory in combating circulatory depression.

Carbon dioxide is not indicated in respiratory depression during thiopental sodium anesthesia. Oxygen alone, delivered by artificial means if necessary, will suffice. It has been demonstrated that carbon dioxide may, indeed, act as a further depressant rather than as a stimulant to respiration in instances of overdosage with thiopental sodium.[21]

Hiccoughs occur occasionally and are relieved with oxygen and carbon dioxide. If the hiccoughs persist, the percentage of nitrous oxide may be increased, and if this fails, halting administration of the anesthetic will relieve the condition.

Obviously, cyanosis should never occur, but in the event that it does, oxygen must be administered at once and a free airway assured.

Equipment

One should not, under any circumstance, attempt to use thiopental sodium in the office unless he has the following emergency equipment and drugs:[22] (1) anesthetic machine to administer oxygen under pressure (resuscitators are practically useless and are probably the cause of many fatalities), (2) portable oxygen machine, with pressure bag, for administration of oxygen in the recovery rooms, (3) aspirator, (4) laryngoscope, (5) endotracheal tubes of various sizes and (6) analeptics (picrotoxin or pentamethylenetetrazol).

Advantages

Thiopental sodium has the following advantages:

1. It is noninflammable and nonexplosive, permitting its use in the presence of live cautery.

2. Induction is easy and convenient.[23]

3. It produces relaxation adequate for oral surgery.

19. Thomas, G. J., Pentothal Sodium Pharmacologic Action, Range of Usefulness, Complications and Their Management. *Anesth. & Analg.* 23:8 (Jan.-Feb.) 1944.

20. French, E. A., Pentothal Sodium Oxygen Anesthesia in Major Surgery. *Am. J. Surg.* 61:16 (July) 1943.

21. Foster, A. D., Jr., personal communication.

22. Jarman, Ronald, History of Intravenous Anaesthesia With Ten Years' Experience in the Use of Pentothal Sodium. *Post-Grad. M. J.* 22:311 (Oct.) 1946.

23. Grant-Whyte, J., Pentothal Sodium Anaesthesia in Dentistry; a Review of 500 Cases. *South African M. J.* 19:206 (June 23) 1945.

4. Postoperative recovery is rapid without nausea.[24]

5. Induction is rapid, a boon for apprehensive patients.[25]

6. The patient's appreciation of the experience eliminates fear or apprehension of future anesthetic experience.

Comment

There is no doubt that a local anesthetic is the safest anesthetic. However, the majority of patients request a general anesthetic for oral surgical operations, and thiopental sodium, because of its numerous advantages, is becoming increasingly popular. After employing thiopental sodium, with or without nitrous oxide as a supplement, for all types of operative procedures in the field of oral surgery, I am convinced that this anesthetic approaches the ideal in general anesthesia for office use when the drug is administered by a thoroughly trained anesthetist who is able to deal with any situation which may present itself.—*2007 Wilshire Boulevard.*

24. Hubbell, A. O., Pentothal Sodium Anesthesia for Dental Surgery in Office Practice and Control of Recovery Time. *Anesthesiology* 4:174 (March) 1943.

25. Thompson, E. C., Continuous Pentothal Sodium Analgesia, With Nerve Block, in Oral Surgery; an Analysis of One Hundred Consecutive Cases. *J. Oral Surg.* 3:205 (July) 1945.

SUBLINGUAL APPLICATION OF A SOLUTION OF OXALIC AND MALONIC ACIDS TO DECREASE CLOTTING TIME IN ORAL SURGERY

Bernard F. Linn, D.D.S., Newark, N.J.

MANY factors influence the amount of bleeding encountered during an oral operation. Among these are the amount of injury to tissue and blood vessels, the general condition of the patient, the amount of manipulation necessary and the rate of clotting of the patient's blood. All but the last are beyond the surgeon's control. The amount of tissue damage is dependent upon the surgical procedures necessary, as is the amount of manipulation. The condition of the patient can be improved in time, but few patients are so debilitated as to warrant delay, particularly for an oral operation. The clotting time can, however, be shortened or prolonged at the discretion of the operator. Obviously, the shorter the clotting time, the sooner a firm blood clot will form and the less bleeding will be encountered.

It was believed worth while, therefore, to investigate methods of reducing the clotting time. Mead,[1] in his review of hemostatics, recommends Koagamin,[2] a preparation originally meant for parenteral use. Feder[3] experimented with this solution as a coagulant and found that it sometimes gave spectacular results. Administered intravenously, it was of great value when all ordinary

1. Mead, S. V., Control of Hemorrhage. *Am. J. Orthodont. & Oral Surg.* 26:982 (October) 1940.

2. According to the manufacturers, Chatham Pharmaceuticals, Inc., Newark 2, N. J., Koagamin is an acid aqueous solution containing 0.5 per cent oxalic acid and 0.25 per cent malonic acid.

3. Feder, J. M., Some Modern Concepts of Oral Pathology. *South. Med. & Surg.* 105:439 (October) 1943.

measures had failed to arrest hemorrhage. McGavack[4] reported on four "bleeders" treated with Koagamin. For one of these, who was only mildly hemophilic, extraction of teeth was indicated. The solution reduced this patient's clotting time to 2.5 minutes. Postoperative sustaining doses were administered every four hours, and healing was uneventful.

A number of other references have been made to prophylactic and therapeutic use of the dicarboxylic acids. Schumann[5] reported decreased bleeding in various surgical and obstetrical cases. Herbst and Weinstein[6] obtained a decrease of bleeding in their surgical cases. Stokes, Beerman and Ingraham[7] have recommended Koagamin for treatment of purpura haemorrhagica. Numerous reports by other authors confirm the action of the dicarboxylic acids in reducing clotting time and indicate that Koagamin has no toxic or untoward effects, having been used for many years without unfavorable reaction.

Parenteral administration, however, is cumbersome, and a search was made for a vehicle that would favor rapid absorption and systemic action of dicarboxylic acids applied to the oral mucosa. Hanan[8] reported topical application of penicillin and its absorption through the sublingual veins. Absorption was as rapid and as effective as that observed after subcutaneous injection.

In the present study a mixture of propylene glycol and ethyl alcohol containing oxalic acid and malonic acid was rapidly absorbed from dried mucous surfaces, and a systemic effect of the dicarboxylic acids was measurable in about fifteen minutes.[9] For simplicity, this propylene glycol-alcohol solution of the dicarboxylic acids will hereafter be referred to as the sublingual solution.

4. McGavack, T. H., Hemophilia. *M. Clin. North America* 24:791 (May) 1940.
5. Schumann, E. A., Benign Uterine Hemorrhage in Nonpregnant Women. *Am. J. Surg.* 48:353 (May) 1940.
6. Herbst, W. P., and Weinstein, J. J., Observations of Action of Koagamin. *J. Urol.* 51:325 (March) 1944.
7. Stokes, J. H.; Beerman, H., and Ingraham, N. R., *Modern Clinical Syphilology*. Third ed. Philadelphia: W. B. Saunders Company, 1944.
8. Hanan, J. J., Sublingual Administration of Penicillin. *J. M. Soc. New Jersey* 43:127 (April) 1946.

Methods

In application of the sublingual solution, technic is of the utmost importance. The floor of the mouth is first thoroughly dried with a gauze pad, which is then used to support the tongue in an elevated position. Four drops of the sublingual solution are applied, two over each lingual vein. The tongue is kept elevated and the mouth held open for one or two minutes or until the solution is absorbed. The patient can then close the mouth and spit or swallow as desired.

For this investigation the capillary tube method, because of its simplicity, was used to determine the clotting time. Capillary tubes of nearly uniform 1 mm. bore were purchased from a glass manufacturer. The tubes were inspected for variations, and those with too large or too small an internal diameter were eliminated. To obtain the blood sample, 23-gauge 1-inch Huber point needles and 2 cc. syringes, previously cleaned and sterilized by dry heat (to insure freedom from moisture) were used. A tourniquet was applied and the needle inserted into the lumen of the vein. Before a sample was drawn, however, the tourniquet was removed and the color of the arm allowed to return to normal, so as to eliminate hemostasis with consequent alteration of the blood sample. When a normal color returned a blood sample was drawn, and as the first blood appeared in the syringe a stop watch was started. Approximately 1 cc. of

9. The alcohol-propylene glycol solution of dicarboxylic acids was supplied by Chatham Phamaceuticals, Inc., Newark 2, N. J., to correspond in activity to their aqueous parenteral solution known as Koagamin. It contains 8.5 per cent oxalic acid and 4.25 per cent malonic acid in a mixture of ethyl alcohol 19 per cent and propylene glycol 81 per cent.

blood was drawn. Immediately thereafter the needle was inserted into the lumen of a capillary tube and the blood allowed to flow slowly into it. The capillary tube was then scored and broken at intervals of 1 cm. until a strand of fibrin appeared between the broken ends. The time at which the first strand appeared was taken at the end point of clotting time.

Results

The study included more than 200 unselected clinical cases, in many of which there was record of previous oral operations followed by prolonged bleeding. As was to be expected with a group taken at random, these earlier procedures included most of the routine types of oral operation. Table 1 presents representative cases.

Several of these warrant further discussion. The patient in Case 1, the first on whom the effect of the drug was studied, was being prepared for full upper and lower dentures. Profuse and prolonged bleeding made the first multiple extractions tedious. After the first few visits the sublingual solution was applied just prior to administration of the anesthetic, and the patient was able to leave the office thirty minutes after completion of the work, with a firm clot, no oozing and no secondary bleeding.

Case 3 demonstrates one of the marked advantages of decreased clotting time. The sublingual solution was applied just prior to administration of the anesthetic. During the operation, removal of a lower bicuspid root, excellent demarcation between the root and the bone facilitated removal of the root. A similar experience was encountered in Case 13. A root tip was broken during the extraction. In this case the sublingual solution had been administered preoperatively, and excellent demarcation and visualization of the field facilitated removal of the broken tip.

Case 15 was of special interest, as demonstrating the difficulties involved in interpreting clinical results. The patient was undergoing penicillin treatment for a peritonsillar abscess and pericoronal infection in the region of a third molar. The third molar was extracted. Profuse bleeding followed the operation despite administration of the sublingual solution, and it was concluded that the drug had had no effect. Three days later profuse secondary bleeding interrupted an otherwise uneventful recovery. Pressure and a variety of local hemostatics were tried but produced no evidence of clot formation. A second administration of the sublingual solution was made and pressure applied, and the bleeding was checked in thirty minutes. The role of other factors in this case is difficult to evaluate, but there is little doubt that the sublingual solution finally produced a decrease in coagulation time and thus played a strong part in control of the secondary bleeding.

The most impressive results obtained with the sublingual solution were observed in patients being prepared for immediate dentures. As a rule such patients, on the return visit, show their dentures coated with a thick mass of clotted blood, frequently putrid and so annoying that the patient has been forced to remove the dentures. A striking improvement was noted when the sublingual solution was used. The dentures were cleaner, and the clots were firmer, smaller and usually restricted to the sockets, though they sometimes extended in a thin film over the dentures. The patient invariably felt more comfortable because of the less dense clot and the generally improved condition of the mouth.

Since clinical results are difficult to evaluate because of their dependence on subjective impressions, and since it was recognized that the surgical pro-

cedures themselves might have caused a decrease in clotting time by inciting mobilization of platelets or prothrombin, the effect of the sublingual preparation on twenty-five normal persons was determined. The normal clotting time was measured, the solution was applied and clotting time was determined again fifteen minutes and forty-five minutes after medication. Blood samples were withdrawn from alternate arms, and no vein was punctured more than once.

The results are presented in Table 2. Note that application of the sublingual solution caused a decrease in the clotting time for 21 of 24 persons at fifteen minutes and for 23 of 25 persons at forty-five minutes. This decrease varied from 5 to 69 per cent at fifteen minutes and from 3 to 69 per cent at forty-five minutes. The average decrease at fifteen minutes was 33.14 per cent, and at forty-five minutes, 39.71 per cent.

Summary

Clinical appraisal of a drug that reduces clotting time is difficult. In this series of more than 200 clinical cases,

Table 1.—Effects of decreased clotting time due to use of dicarboxylic acid solution[9] in twenty-six oral surgical operations

Case	Operation	Observations
1	Multiple extraction	Clot formed, no oozing after 30 minutes
2	Simple extraction, first molar	Firm clot, no oozing after 20 minutes*
3	Root removal, lower bicuspid	Little oozing; visibility good; patient discharged in 30 minutes
4	Extraction, impacted third molar	Firm clot, no oozing after 30 minutes
5	Removal of soft redundant tissue	Preoperative oozing due to manipulation, controlled after operation
6	Simple extraction, lower bicuspid	Firm clot, slight oozing after 20 minutes*
7	Multiple extraction (pyorrheal abscesses at bifurcation of roots)	Clear field during operation; firm clot, rapid healing
8	Extraction, devitalized bicuspid	Firm clot, rapid healing
9	Multiple extraction	Firm clot, no oozing after 45 minutes*
10	Extraction, impacted third molar	Firm, normal clot; rapid, uneventful healing
11	Simple extraction	Oozing controlled; immediate bridge replacement
12	Simple extraction, roots of lateral incisor and bicuspid	No profuse bleeding, uneventful healing
13	Simple extraction, upper first bicuspid	Root tip broken during extraction; good visualization; firm clot 20 minutes after operation
14	Simple extraction	Firm clot, with no oozing, in 30 minutes*
15	Extraction, third molar	No result; profuse bleeding; secondary bleeding 3 days later responded to sublingual solution
16	Multiple extraction	Firm, quickly formed clot; no oozing
17	Simple extraction, bicuspid	Firm, early clot; no oozing
18	Simple extraction, molar	Firm clot, no oozing
19	Simple extraction, bicuspid	Firm clot, no oozing
20	Simple extraction, cuspid	Firm clot, no oozing
21	Simple extraction, molar	Firm clot, no oozing
22	Extraction, impacted third molar	Visibility good; firm, early clot; no oozing or secondary bleeding
23, 24, 25, 26	Multiple extraction	Oozing well controlled; clot firm in 24 hours; no false clot; denture cleaner, with less odor than usual

*Previous oral operations had been followed by profuse and prolonged bleeding.

Table 2.—Effect of sublingual application of dicarboxylic acid solution* on clotting time of blood of normal persons

Subject	Clotting time before medication, seconds	Clotting time after medication, seconds		Decrease in clotting time, seconds		Decrease of clotting time, percentage	
		15 minute interval	45 minute interval	15 minute interval	45 minute interval	15 minute interval	45 minute interval
1	219	157	250*	62	31*	28	14*
2	297	233	180	64	117	21	39
3	178	154	139	24	39	13	21
4	239	170	121	69	118	28	49
5	452	137	231	315	221	69	48
6	437	139	135	298	302	68	69
7	193	214*	118	21*	75	10*	38
8	189	.....	130	.....	59	.....	31
9	184	122	190*	62	6*	33	3*
10	286	168	146	118	140	41	48
11	192	143	121	49	71	25	37
12	161	170*	114	9*	47	5*	28
13	179	117	91	62	88	34	48
14	177	129	107	48	70	27	39
15	166	178*	149	12*	17	7*	10
16	174	143	146	31	28	17	16
17	215	194	162	21	53	9	24
18	240	150	112	90	128	37	53
19	200	179	133	21	67	10	33
20	195	115	177	80	18	41	9
21	205	116	110	89	95	43	46
22	232	114	115	118	117	50	50
23	209	116	150	93	59	44	28
24	272	209	133	63	139	23	51
25	179	119	155	60	24	33	13

*Designates an increase rather than a decrease for that reading.

personal observation was the only available criterion. Many patients volunteered the information that their previous operations had been followed by prolonged, profuse bleeding or prolonged oozing. In this study there was but one case of prolonged bleeding, and this case was complicated by pericoronal and peritonsillar infection and penicillin treatment.

The sublingual solution proved particularly effective when rapid clotting was needed to facilitate manipulation. For the extraction of broken roots and impacted teeth, its use resulted in excellent demarcation of structures. This reduced manipulation and tissue damage and seemed to decrease extravasation of blood and serum, which in turn reduced the amount of swelling and pain. When an immediate denture is to be furnished, the decreased clotting time is of definite importance, since it encourages easily formed, firm clots. Decreased bleeding also means greater comfort for the patient.

These studies demonstrate the applicability of the dicarboxylic acids to

routine oral surgery. Applied sublingually in a suitable vehicle, they have an effective hemostatic action. The effect can be observed within fifteen minutes, and increased coagulability of the blood is demonstrable forty-five minutes after application. If the sublingual solution is applied just prior to injection of the anesthetic, maximum hemostatic action is obtained during and immediately after the operation. When there is excessive or persistent bleeding, further applications may be necessary.

These studies have further demonstrated that the reduction in clotting time is an action of the dicarboxylic acids. In a control group of twenty-five nonsurgical cases, reductions in clotting time averaged 33 per cent at fifteen minutes and 39 per cent at forty-five minutes. As has been pointed out, prophylactic use of the sublingual solution offers still another improvement in surgical technic, since the material encourages early formation of a firm blood clot. The mechanism of the action is in the blood itself, so that the need for hemostatics in the socket or the operative area is reduced. In this study there were no evidences of toxicity or untoward reaction. In no case was the application distressing to the patient.

Conclusions

1. Sublingual administration of oxalic acid and malonic acid in an alcohol-propylene glycol base produces a marked decrease in clotting time.

2. The average decrease in a group of nonsurgical control cases was 33 per cent at fifteen minutes and 39 per cent at forty-five minutes.

3. This decrease of clotting time encourages the early formation of firm blood clots in oral surgical procedures.

4. The reduced bleeding decreases extravasation and the necessity of tissue manipulation, thus insuring less pain and greater comfort for the patient.

5. No evidence of toxic or untoward reaction was noted.—*901 Broad Street.*

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Professional Ideals.—Manifestly the Healing Professions must, of necessity, function and develop under the conditions of freedom in the quest of knowledge and skill, and in conformity with their historical aspirations. Any lesser role means deterioration, and moral and technical decline. Hence, the leaders of the Professions, to be amongst the sages assessing and preserving human values of abiding worth in a fast-changing, chaotic world, must have a living Faith in the ideals of the professions — they must fervently desire their upholding and enhancement — and seek to secure them with firm purpose and unyielding resolution. Anything less will not be enlightened and inspiring leadership—but misguided and misleading compromise and appeasement—in short, the inception of a steady process of internal decline and decay.—*"The Ariadne Thread of Faith," editorial, S. African D. J. 22:116, March 1948.*

NECROTIZING ULCERATIVE GINGIVITIS IN THE ARMY: INCIDENCE, COMMUNICABILITY AND TREATMENT

Saul Schluger, D.D.S., Jersey City, N. J.

In the last few years there has been an earnest effort in the dental profession to evaluate and re-examine our proved knowledge of necrotizing ulcerative gingivitis and to discard unproved and erroneous conceptions. The recent report of the Research Commission of the American Dental Association on necrotizing gingivitis has rendered invaluable service in this direction by relegating chemotherapy to its proper position as a mere adjunct to rational treatment.[1]

There also has been in recent years a healthy suspicion cast from most responsible quarters on the communicability of the infection. Although it is admittedly difficult to establish adequate controls which would give us a definite answer, it is possible to draw certain conclusions from a mass of data carefully collected and tabulated.

For several reasons the Army furnishes ideal conditions under which to collect these data. First, the incidence of necrotizing ulcerative gingivitis was generally far greater there than in civilian life. Second, the intimacy necessarily enforced by garrison and field life could not be matched on such a scale on so true a cross-section of our population elsewhere. Third, the patient was under control which was comparatively complete so that results could be observed.

The Army Medical Department had much the same conception of Vincent's stomatitis that was held by the average dentist. In a circular letter issued on April 12, 1943, it outlined the old familiar description of the disease in its classical form with directions for treatment consisting of topical application of chromic acid and potassium permangenate plus hydrogen peroxide mouthwashes in the acute stage. The infection was regarded as "infectious and contagious," and the use of separate eating utensils, which were to be boiled after use, was recommended. It was suggested further that the calculus might be removed after a few days of treatment. All patients who had severe infection were to be hospitalized and treated by the dentist in collaboration with a medical officer. What that treatment in collaboration was to consist of was not mentioned.[2] In fairness to the Army Medical Department, it must be stated that the directions for treatment were in the nature of suggestions and were by no means directives.

Although I do not, and certainly did not at the time, agree with the conception outlined with regard to the nature, incidence or treatment of necrotizing gingivitis, Circular Letter No. 50 did present the safe, orthodox and conservative view at the time it was issued.

The principal purpose of this study is to show, with strong supporting presumptive evidence, that the usual mechanics of transmission of an infection do not hold true in necrotizing gingivitis. Proximity, intimacy and possible contamination do not seem to be factors, but

1. Vincent's Infection: A Report by a Committee of the Research Commission. *J.A.D.A.* 32:756 (June 1) 1945.

2. War Department, Office of the Surgeon General, Circular Letter No. 50. April 12, 1943.

general health, tissue resistance, fatigue and oral hygiene are definite and important criteria in the incidence of the disease.

Army Conditions

Before discussing the material compiled, it might be well to examine the background against which the information was collected. A better understanding and a truer evaluation of the results will be possible if it is understood how the patients lived under varying conditions of Army life.

The Army company constitutes the closest organization comparable to the family. Each company maintains its own kitchens and mess hall, its members live in company barracks, and toilet facilities are allocated to it exclusively. The members of the company spend the whole working day together, they mess together, they sleep together, and they usually spend the few hours of recreation together. The company strength is usually 100 to 150 men.

In organized camps and garrisons the men of a company live in barracks. Under the conditions of this study, these were one or two story wooden buildings consisting mainly of one large common sleeping room to each floor. Most of the men in a company slept in these large common dormitories. Here conditions were crowded. The cots were frequently of the double-decker variety and in any event were placed closely together. There was usually not more than 3 feet of space between cots. Scientific ventilation was attempted, and the head and foot positions of adjoining beds were alternated, but in spite of these measures the men slept in uncomfortable proximity.

These conditions did not exist on the field, where the company went frequently for specialized training. Here the men slept in bedrolls which were placed on the ground. Almost always they were without shelter of any kind in clear weather, and the space between sleepers was always considerably greater than that possible in barracks. It would be well to note this point.

In garrison the men dined in the company mess hall on chinaware dishes. Although these mess halls were crowded, with the men seated elbow to elbow, the standard of hygiene was high. Dishes were well scrubbed, though not sterilized, and had to be air dried. They were never touched with a towel. Tables were so constructed that the top could be disarticulated to provide access to crumbs and scraps that might have been lodged between the planks. These tables were cleaned well after each meal. There was a rigid weekly inspection in accordance with standards that were better than those for the average clean home. In addition, there was the mess officer whose duty it was to maintain those standards in so far as practicable.

On the field the men ate from mess kits which were issued as personal equipment. There was no interchange of mess kits. After finishing his meal the soldier proceeded to a series of three large cans. In the first there was hot soapy water and a scrubbing brush, with which the entire kit and utensils were scrubbed thoroughly. In the next can he rinsed and brushed his kit in hot clear water to remove the soap. Finally, in the last can he rinsed his mess kit thoroughly in clear boiling water. The equipment was then air-dried and stowed away in his pack.

From the foregoing information it would seem that the incidence of necrotizing ulcerative gingivitis, because of the supposed communicability of the disease, would be more common in the garrison than in the field. In garrison there was far more social intercourse with far less insularity in so far as eating and drinking utensils were concerned, and the opportunities for actual bacterial transmission were myriad. There was even the insidious agent of alcohol, with its lowering of the resistance of the host to infec-

tion and the lowering of ordinary hygienic conduct. And yet anyone who was in any position to observe large numbers of men under these conditions will bear witness that the disease flared up in the field. Since in the field the soldier slept in the open air with far more room and ventilation than was possible in barracks, used his own personal mess kit which was always boiled after use and had no social life with its possibilities for contact, the suspicion is inescapable that necrotizing ulcerative gingivitis does not occur by communication.

There were present, however, other factors which should be mentioned. The quality of rations and the opportunities for personal hygiene, plus the actual work and the fatigue engendered by it, are important.

In garrison there is, for the most part, a regular working day which may be compared roughly with the working day of the average laboring civilian. There were some details which required a longer time than the usual working day, but these duties affected only a small number of men at any given time since they were assigned in rotation. For the most part the working day began at reveille and ended with retreat for the company. The food furnished in the company mess hall was hearty and plentiful. It was unbalanced and deficient in exactly the same way in which most American diets are deficient. The vitamin B complex series was supplied only by fortified breads and cereals and by beef cooked in large quantity, and vitamin C was supplied only partially. The hygienic facilities furnished in the company barracks were generally adequate. Although there was serious crowding, it was possible for the soldier to practice personal hygiene to a high degree.

In the field there was no actual beginning or end to the day. Field exercises might extend for many days without end, night problems were frequent and taxing, and the sleeping hours were irregular. The work was arduous and taxing. Most often field rations were even more inadequate than were garrison rations. In fact, the various types of field rations then available were adapted generally to easy use rather than to nutritional value. Late in the war this situation was somewhat improved, but never did the quality of field rations approach that served in garrison. Any standard of personal hygiene was difficult to attain, and oral hygiene was the most difficult of all to practice. Without the usual formations to divide the day it was easy to neglect such chores.

From the foregoing discussion it is evident that there are two distinct sets of conditions in Army life. Garrison life provides ample opportunity for transmission of infection but provides comparatively high standards of comfort and personal hygiene. Field life, on the other hand, presents few opportunities for communication of infection but offers poorer food, lower standards of oral hygiene and greater physical effort and fatigue. Although necrotizing ulcerative gingivitis was certainly not uncommon in garrison, it was far more common in the field. From this the inference is plain that the factor of resistance of the host to infection plays an uncommonly large part in the incidence of such infection.

Material and Methods

The accompanying table was compiled in two general sections. The first section was collected while I was stationed in Camp Chaffee, Ark. For five months I examined every man in the camp who had necrotizing ulcerative gingivitis and treated most of them. The second section was compiled mainly in the Mojave Desert in the spring and summer of 1943 and at Fort Benning, Ga. in the fall and winter of 1943-1944. An accurate record was kept of the date on which the condition appeared and the company to which the patient belonged.

Only cardinal cases of necrotizing ulcerative gingivitis were accepted for this survey. It might be mentioned at this point that in most of the cases in the Army in which the "official" diagnosis was "stomatitis Vincent's," the diagnosis was incorrect. For the most part, these conditions proved to be any gingival disease in which frank inflammatory reactions were present. It was for this reason that great care was taken to include only those cases in which the condition was acute and classical.

The patients were instructed not to use the precautions commonly practiced in the treatment of this infection. They were not isolated but were told to continue a normal social pattern in their Army contacts. Specific instructions were given that they were to eat from the china dishes commonly used in the mess hall and not from their own mess kits as is customary in such cases. Frequent calls were received from worried mess sergeants as to the authenticity of these instructions but the procedure was uniform.

Observations

Under these conditions, if the disease were transmissible by the usual methods, there should have been a definite pattern in the appearance of new cases. There should have been, at the very least, a number of cases from the same company in approximately the same period. The fact that such a condition never materialized in spite of the enforced intimacy of the men under the varying conditions of Army life is certainly strongly suggestive that necrotizing ulcerative gingivitis is not transmissible by contact or by any of the usual means of transmission of infection.

In fact, the pattern of transmission seems to be of an entirely different sort. There was a rise in incidence when fatigue or trauma was present, concomitant with a somewhat greater insularity of the soldier. Some of the histories of these patients shed some additional light on the subject. In 3 cases (Nos. 56, 58 and 60), the infection appeared after a severe beating about the mouth. In 7 cases ulcerative gingivitis appeared after long periods of hospitalization for operation, fractures or other conditions, none of which was connected directly with the mouth.

In considering these two catagories, it is evident that the infection occurred under conditions of local trauma in 3 cases and that entirely different conditions surrounded the incidence of infection of the 7 hospitalized patients. In the hospital there was strict insularity. Hospital dishes in all wards were sterilized, and the standard of hygiene was high. Complete rest and cleanliness were the strict rule. How then can one explain the appearance of the infection except in terms of physical debility and lowered resistance and not in terms of sepsis and transmission?

Twelve patients never brushed their teeth at all. The cause of the condition in these cases corresponds with that in the two categories previously mentioned. Unfortunately, it was not possible to obtain more than a brief history. Two factors, however, always were determined: first, whether the patient had associated with a person with active necrotizing gingivitis, and second, what his personal habits were with regard to activity and hygiene.

Discussion of Table

Two general categories were noted on the Table: An "h" next to the number of a case signifies that the patient acquired the infection while in the hospital for a condition other than necrotizing ulcerative gingivitis. A "b," on the other hand, signifies that the patient acquired gingivitis either on bivouac or immediately on his return.

In a total of 92 cases, necrotizing ul-

cerative gingivitis originated in the field or under field conditions in 19 cases. Although a casual appraisal would seem to indicate that this is but 20.6 per cent of the total number of cases, it must be remembered that the battalions involved contained about 500 men and usually went out to the field as a single unit. The remaining population of the camp numbered between 15,000 and 40,000 men. It is in this perspective that the index of incidence should be viewed.

Patients who contracted the disease while in the hospital for conditions other than gingivitis numbered 7. Here, too, although 7 cases of a total of 92 represents only 7.5 per cent of the whole number of cases studied, the situation should be viewed in its true perspective; that is, the total population of the camp compared with the total population of the hospital. Here, of course, the figures are much more in favor of the hospital, but when it is considered that hospital dishes are sterilized after each meal and hygiene, insularity and rest are at their highest level, it is a significant indication that incidence is by means other than transmission.

Epidemics

It might be well to examine the nature of some of the so-called epidemics of necrotizing ulcerative gingivitis unofficially reported from various combat theaters as well as from sections of this country. In every instance that has come to my attention a definite nonbacterial factor easily could be discovered. For example, one report contained an account of an entire company stricken with the disease two or three days after V-E Day. This company had not been in combat for some time, and consequently the men were thoroughly rested. Further examination of this report revealed that they had been living for weeks on "C" rations, the most inadequate of all Army rations, consisting of three varieties of canned stew, candy and some wafers. In addition, there had been a rather riotous celebration with considerable drinking.

It is easy to find a carrier if an investigation is made. Anyone can give a history of touching or using a possibly contaminated object during every day of his life, and if the preconception is present in the mind of the dentist that the disease is transmitted, it may easily be supported by this sort of evidence.

In fact, the conclusion seems inescapable that necrotizing ulcerative gingivitis, although it is an infection, certainly does not behave in the manner of classical infections. It merely follows many other physiologic and pathologic phenomena which show special and atypical behavior in the oral cavity. The resistance of the host plays the same role, with all its variations and inconsistencies, in gingivitis as it does in many other oral diseases.

Treatment

Since the gingival crevice and the interproximal papilla seem to make possible the incidence of necrotizing ulcerative gingivitis, treatment was given on this basis. Treatment in all cases, without exception, was deep, immediate and thorough curettage.[3] No adjunctive chemical agent was used in clinic treatment. A mouthwash of equal parts of water and 3 per cent hydrogen peroxide was prescribed and used six to eight times daily whenever it was available. When this agent was unavailable, which was frequently the case, plain water was substituted and used with somewhat greater frequency. The results or the rapidity of response was not materially different regardless of which was used.

It seems to be difficult for some clinicians to believe that curettage in cases of acute, fulminating and violent infection actually was carried out at the time of the first consultation without some

3. Schluger, Saul, The Etiology and Treatment of Vincent's Infection. *J.A.D.A.* 30:524 (April 1) 1943.

Ninety-two cases of necrotizing ulcerative gingivitis in the Army

Case	Treatments	Date reported	Company	Battalion regiment	Division
1 (b)	3	8-29-42	Srv Btr	69th AFA	6th A.D.
2	3	9- 8-42	4th Cas	68th A.R.	6th A.D.
3	2	9-13-42	Btr B	93rd AFA	6th A.D.
4	3	9-14-42	C	69th A.R.	6th A.D.
5	3	9-15-42	Btr A	69th AFA	6th A.D.
6 (b)	2	9-16-42		87th Ord	2nd Army
7 (b)	3	9-17-42	Btr A	212 AFA	6th A.D.
8 (b)	2	9-18-42	HQ Btr	212 AFA	6th A.D.
9	2	9-22-42	Btr C	93rd AFA	6th A.D.
10	3	9-23-42	Med Det	819th TD	2nd Army
11 (b)	2	9-23-42	Btr C	128 AFA	6th A.D.
12	3	9-24-42	Btr C	93rd AFA	6th A.D.
13 (b)	3	9-24-42	Co B	86th Rcn	6th A.D.
14 (b)	3	9-24-42	HQ Co	Maint Bn	6th A.D.
15 (b)	3	9-26-42	Co H	50th A Inf	6th A.D.
16	2	9-28-42	Co B	Maint Bn	6th A.D.
17	3	9-28-42	HQ Btr	128 AFA	6th A.D.
18	2	9-28-42	Btr C	212 AFA	6th A.D.
19 (b)	3	9-29-42	146 Sig Co.		6th A.D.
20 (b)	2	10- 2-42	Co G	69th A.R.	6th A.D.
21 (b)	2	10- 3-42	HQ Co	2Bn 68AR	6th A.D.
22	3	10- 6-42	Srv Co	68th A.R.	6th A.D.
23 (h)	2	10- 7-42	HQ Co	3Bn 68AR	6th A.D.
24 (h)	2	10- 7-42	Co C	819 TD Bn	2nd Army
25	2	10-16-42	Srv Btr	93rd AFA	6th A.D.
26	3	10-16-42	Co D	56th Ord	8th S.C.
27	4	10-16-42	Co A	Sup Bn	14th AD
28	2	10-21-42	Co I	62nd AR	14th AD

Ninety-two cases of necrotizing ulcerative gingivitis in the Army (contd)

Case	Treatments	Date reported	Company	Battalion regiment	Division
29 (h)	3	10-21-42	Co H	42nd AR	14th AD
30	4	10-21-42	Srv Btr	59th AFA	14th AD
31	2	10-27-42	Co B	501st AFA	
32	2	10-28-42	Btr C	59th AFA	14th AD
33	3	10-29-42	889th Ord	Heavy M.	2nd Army
34 (b)	3	10-29-42	HQ Co	817th TDBn	2nd Army
35	3	11- 1-42	Btr C	500th AFA	
36	2	11- 6-42	QM Det	Motor Transport	8th S.C.
37	2	11- 7-42	Co C	96th QM Baking Bn	8th S.C.
38 (b)	2	11-10-42	Btr A	69th AFA	
39	3	11-10-42	Evac Hosp	113th Sta	Hosp
40	3	12- 4-42	HQ Btr	69th AFA	
41	3	12- 7-42	HQ Co	817th TDBn	2nd Army
42	2	12- 7-42	Rcn Co	822 TDBn	2nd Army
43 (b)	2	12- 8-42	Co G	62nd A.R.	14th AD
44	3	12- 8-42	Co A	47th A.R.	14th AD
45 (b)	4	12- 8-42	HQ Co	Sup Bn	14th AD
46 (h)	2	12-10-42	Co G	47th A.R.	14th AD
47	3	12-10-42	113th Sta	Hosp	
48 (b)	3	12-12-42	HQ Co	2Bn 47AR	14th AD
49	2	12-14-42	HQ Det	1850 SU	
50	2	12-14-42	Srv Btr	69th AFA	
51	3	12-14-42	113th Sta	Hosp	
52	4	12-14-42	HQ Btr	499th AFA	14th AD
53	3	12-17-42	HQ Co	191st Ord	2nd Army
54	3	12-21-42	Srv Co	48th A.R.	14th AD
55	2	12-24-42	HQ Co	Sup Sec	1850 SU

Ninety-two cases of necrotizing ulcerative gingivitis in the Army (contd)

Case	Treatments	Date reported	Company	Battalion regiment	Division
56	2	12-30-42	HQ Co	M.P. Sec	1850 SU
57	2	1- 5-43	Srv Btr	93rd AFA	
58 (h)	3	1- 6-43	HQ Co	M.P. Sec	1850 SU
59	3	1- 6-43	HQ Co	889th Ord	2nd Army
60	4	1- 6-43	HQ Co	M.P. Sec	1850 SU
61 (h)	2	1-12-43	Ord Det		1850 SU
62	2	1-15-43	Co C	889th Ord	2nd Army
63	2	1-16-43	HQ Co	Sup Sec	1850 SU
64	3	1-19-43	HQ Co	333rd Ord	2nd Army
65 (h)	2	1-22-43	Maint Bn		14th AD
66	2	1-23-43	96th QM	Bakery Bn	1850 SU
67	3	1-27-43	Heavy Maint	889th Ord	2nd Army
68	2	1-30-43	HQ Co	Sup Sec	1850 SU
69	1	9-13-43	Co C	77th Med	7th AD
70	3	9-13-43	Co A	Maint.	7th AD
71	2	9-14-43	Btr B	489th AFA	7th AD
72	5	9-14-43	Btr C	434th AFA	7th AD
73	4	9-16-43	Co G	31st A.R.	7th AD
74	3	9-17-43	Co C	40th A.R.	7th AD
75 (b)	3	9-27-43	Co C	709th Tk Bn	
76	2	9-28-43	Co D	709 Tk Bn	
77	2	10- 1-43	HQ Co	709 Tk Bn	
78	4	10- 2-43	Co C	709 Tk Bn	
79	3	10-14-43	Co A	709 Tk Bn	
80	3	10-25-43	Co C	709 Tk Bn	
81	2	11-11-43	Co C	709 Tk Bn	
82	3	11-11-43	HQ Co	709 Tk Bn	
83	2	11-12-43	Serv Co	709 Tk Bn	

Ninety-two cases of necrotizing ulcerative gingivitis in the Army (contd)

Case	Treatments	Date reported	Company	Battalion regiment	Division
84 (b)	2	11-26-43	Co B	709 Tk Bn	
85	4	11-26-43	Co A	709 Tk Bn	
86	3	12- 2-43	Co C	709 Tk Bn	
87	3	12- 8-43	Co B	709 Tk Bn	
88 (b)	2	12-10-43	HQ Co	709 Tk Bn	
89	1	12-22-43	HQ Co	709 Tk Bn	
90	2	12-27-43	Co C	709 Tk Bn	
91	3	12-28-43	Co A	709 Tk Bn	
92	3	1-21-44	Co B	709 Tk Bn	

preliminary treatment of a palliative nature. However, that was exactly what was done. The most frequent objection was that the pain caused by curettage was too acute to be borne easily; however, pain is not a serious factor in treatment. Some of the patients with acute infection were so toxic that they were only partially aware of pain. In the other cases pain was definitely present, but it was consistently within easy control. It was never, even in a single case, a deterrent to treatment. Of course, only curets were used. All coronal scaling was kept to the absolute minimum necessary for access to the subgingival tissues. Slender curets do not displace tissue unduly, and pain is definitely the result of manipulation.

According to the table, the number of treatments necessary for a complete return to health and normal condition of the gingivae varied from one to five treatments, with the average being 2.7 treatments for each patient. Thus, the average patient with acute necrotizing ulcerative gingivitis responded completely in less than three treatments to a treatment which was not essentially bactericidal in character. If the treatment accomplished anything at all it could have done so only by rehabilitating the tissue affected by establishing good hygiene and by relieving stasis by inducing hemorrhage. Even the home care was essentially mechanical. It is admitted that hydrogen peroxide is a mild bactericide, but its principal action in these cases was through the mechanical action it produces by effervescence. This was proved by the use, in some cases, of plain water with essentially the same result. Mechanical flushing seems to be the principal factor in home care.

Penicillin

The work on which this report was based was done before the advent of penicillin. This drug was used for necrotizing ulcerative gingivitis in many Army posts early in 1944. An early report on its use in Scott Field, Ill. stated that the condition "could be controlled or cured with penicillin therapy."[4] That report, issued on June 10, 1944, was the first of many, all similar in content.

Enough time has elapsed, however, since the dramatic entry of this miracu-

4. *Report from the Air Surgeon's Office, Scott Field, Illinois.* June 10, 1944.

lous antibiotic in the field of necrotizing ulcerative gingivitis to evaluate its place in the treatment of this infection. The immediate results obtained are often spectacular in so far as the reduction of the acute symptoms is concerned; however, this is not always the case. Numerous cases have been observed in which the results were inconclusive. When penicillin is used alone, the condition usually reappears and may relapse into a chronic state. Permanent results can be obtained only by following the administration of penicillin with thorough curettage. This widely admitted fact proves, as much as does any other evidence, that the decisive factor is tissue tone and resistance. Even the most successful bactericides and antibiotics alone are not enough to terminate the disease, but curettage alone definitely is enough.

Conclusion

Necrotizing ulcerative gingivitis does not appear to be transmissible by ordinary means of contact. No spread of the infection was to be found under conditions in which groups of men lived in close contact and in which the infected persons used none of the usual precautions. In recorded cases the disease responded quickly and completely to a treatment which is not bactericidal but rehabilitating; that is, curettage with subsequent use of a mouthwash.—*30 Journal Square.*

VALUE OF STRESSBREAKERS FOR UNILATERAL PARTIAL DENTURES WITH FREE END SADDLES

A. F. Schopper, D.D.S., Kansas City, Mo.

The preservation of the natural dentition has always been the principal goal of the dental profession. In the earlier years of dentistry the approach was by the repair of broken-down teeth and the replacement of missing ones. Present-day emphasis is on care of the teeth and investing tissues to prevent disease. Our many local and state organizations are doing increasingly effective work in this direction with programs and publicity in our schools and communities. Early prophylaxis, administration of vitamins, use of inhibitors and dissemination of nutritional advice to the public is materially reducing the number of artificial replacements necessary. Further, dentists have learned to design and construct artificial replacements that are not detrimental to the remaining teeth.

When we supply missing teeth in an arch and use part of the remaining teeth for support (particularly in removable restorations), we often overtax the ability of these teeth. This overtaxing, in many instances, shortens the life of the abutments. Over the years, many dentists have tried to stabilize removable appliances so that they would function independently of the abutment teeth, in order to minimize the strain on the abutments. Some of the methods devised have been successful in prolonging the

Read at the eighty-eighth session of the American Dental Association, Partial Denture Section, Boston, August 5, 1947.

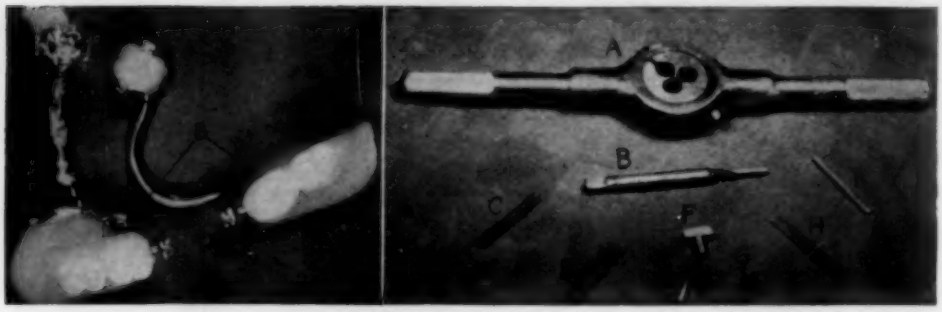

Fig. 1.—Left: Partial dentures with stressbreakers. A, stressbreaker on attachment of upper denture; B, screw (partially removed) that holds free end saddle; C, stressbreaker soldered to lingual bar; D, stressbreaker on palatal bar. Right: Armamentarium. A, die plate for threading 15 gage wire; B, tap for threading 0.055 inch tube; C, 0.055 inch tubing; D, casing, or female portion of stressbreaker; E, screw that holds free end saddle; F, casing and tube assembled; G, shaft, showing hole that screw passes through; H, shafting used for male portion of stressbreaker; I, 15 gage wire used for screws

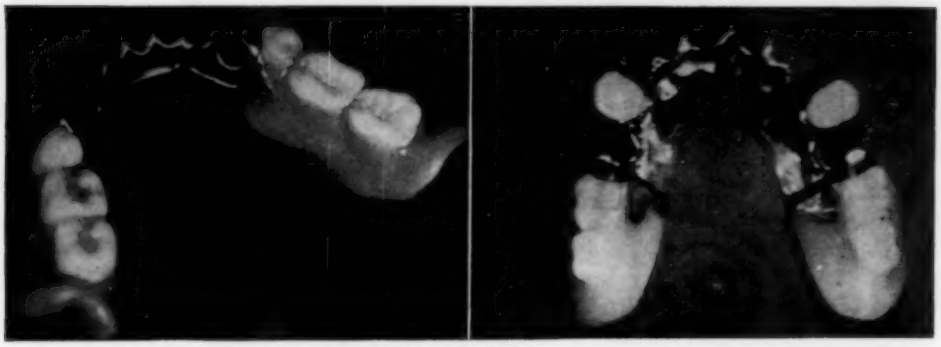

Fig. 2.—Left: Lower partial denture with stressbreaker and free end saddle on each side. Right: Upper partial denture with screws loosened and stressbreakers separated

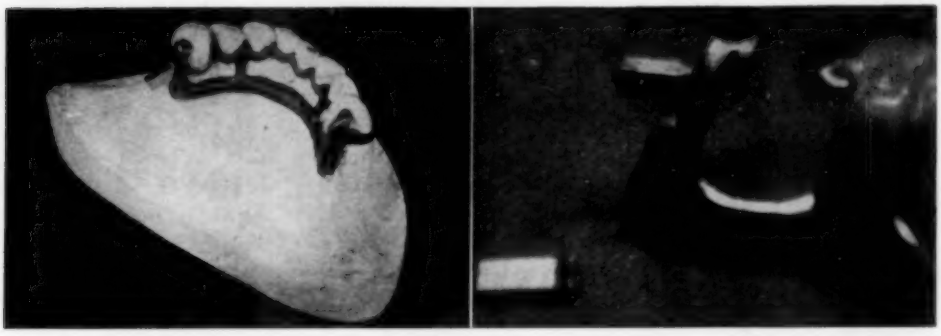

Fig. 3.—Left: Lingual bar waxed in position with shaft. Right: Lingual bar with shaft soldered to it. Casing is at left

life of the abutment teeth; others have only created further strain on these teeth and hastened their destruction.

A stressbreaker is a mechanical break between the abutment tooth (or teeth) and the tissue-bearing component of the appliance. The stressbreaker should be so constructed that it functions independently of the remaining teeth, and thus creates no stress on the abutments. A most efficient and practical one, designed by S. E. West, of San Francisco, is in general use by a number of members of the profession. This stressbreaker can be controlled to function with every movement of the mandible, and its action can be limited as the operator chooses. It not only is used to break the stress on free end saddles, but George A. Selleck, of San Francisco, has shown its application in breaking the stress on both palatal and lingual bars in bilateral partial dentures (Fig. 1, left). By its proper use, the underlying tissues are stimulated and resorption of the ridge is minimized. By its action, the damaging effects of torque to the fibers of the periodontal membrane during the acts of swallowing and night grinding are greatly reduced, if not eliminated. In order to compensate for these two actions, a stressbreaker must have lateral movement as well as hinge action.

The construction of this type of stressbreaker is both simple and exacting; however, the indefinite prolongation of the life of the abutment teeth makes the dentist's efforts worth while. The necessary tools can be purchased in any hardware store. The parts of the stressbreaker are fashioned from any hard gold (Fig. 1, right).

For this type of stressbreaker, the abutment teeth are stabilized by having their attachments soldered to the bar. The free end saddle is connected to this bar by a small screw, which makes the saddle easily removable for repairs or corrections (Fig. 2).

The stressbreaker is constructed by soldering or casting ¼ inch rectangular shafting to the abutment attachment, parallel to the crest of the ridge and midway between the occlusal and gingival margins, so as not to interfere with the occlusal surface of the first pontic or the saddle area of that portion of the partial denture (Figs. 3 and 4, left). A casing of the same length, ground to fit, is put in position on this shaft, and a piece of 0.055 inch tubing, just long enough to extend through to the lingual surface of the first pontic, is soldered to the casing (Fig. 4, right).

The lingual, and usually the occlusal, surface of the first pontic, together with the skeleton to which the remaining pontics are attached, is waxed in position around this casing and cast. After casting, the assemblage is carried back to the cast. The teeth are set up and the denture is cured (Fig. 5, left).

A small drill is inserted in the tube on the lingual surface of the first pontic, and a hole is drilled through the casing and shaft to the opposite side of the inner surface of the casing. The tube is tapped with an 0-80 tap and a screw is made of 15 gage gold wire to fit. It is best not to adjust the movement of the stressbreaker until the patient has worn the denture for at least 48 hours. After this period, one can proceed slowly with the necessary adjustments. The first adjustment is made by enlarging the hole in the shaft through which the screw passes. Other adjustments are made by grinding the surfaces and angles of the shaft. By using a controllable stressbreaker and grinding the occlusion to a balance, it is possible to construct partial dentures with distal extension saddles without severe injury to the abutment teeth.

One unsatisfactory appliance, constructed many years ago, attempted to supply posterior teeth missing on only one side of the arch. This proved so unsuccessful that dentists often advised their patients not to replace the lost

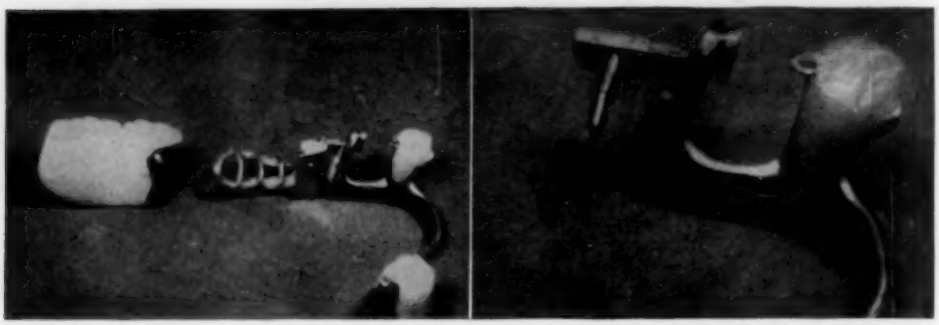

Fig. 4.—Left: Substitute teeth on skeleton which attaches to lingual bar by means of a screw. Another skeleton is shown to illustrate the attachment. Right: Lingual bar with shaft of stressbreaker, casing, threaded tube and screw that retains free end saddle

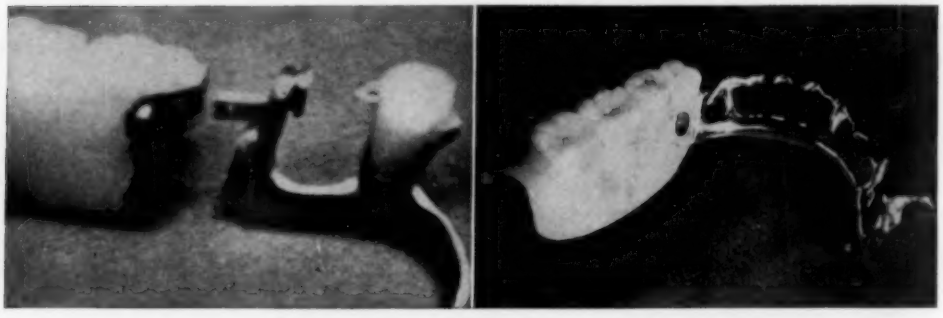

Fig. 5.—Left: Denture after casing has been incorporated into saddle. Right: Unilateral lower partial denture with Hollenback hook (lower right) that inserts between two inlays. The free end saddle has a stressbreaker

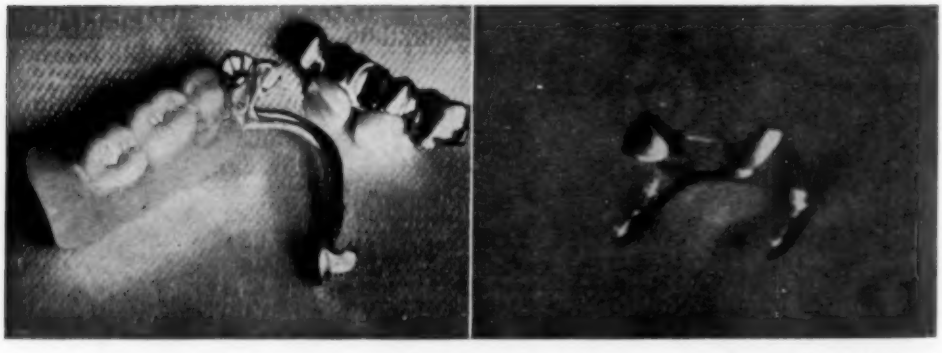

Fig. 6.—Left: Unilateral lower partial denture and fixed bridge, showing Hollenback hook on lingual bar that fits into cavity in fixed bridge. Note stressbreaker on free end saddle. Right: Dunn-Hart cast lingual clasp with rest lugs, for unilateral denture

teeth. Lack of replacement results in the loss of teeth opposing an edentulous ridge. Further, general shifting of the remaining teeth in both arches may create traumatic occlusion and often condylar disturbances.

With the many types of attachments developed, and the use of a satisfactory stressbreaker, this type of denture has proved to be most satisfactory. Two of the most successful attachments were developed by George Hollenback, of Los Angeles, and their construction was ably described by Karl Humphrey.[1,2]

One of these attachments, used when all the teeth are present on one side of the arch, comprises a hook between two molar inlays connected with a 16 gage wire (Fig. 5, right). The other hook attachment described by Dr. Humphrey is for use when a bilateral partial denture can be constructed, or a fixed bridge can be used on one side of the arch and a unilateral partial denture constructed for the opposite side of the arch. When a fixed bridge is used on one side of the arch, the hook attachment is inserted within the pontic of the fixed bridge (Fig. 6, left).

1. Humphrey, Karl, A Uni-lateral Removable Bridge Using a Hook Attachment (Technic Developed by George Hollenback, D.D.S., L.A.) *J. South. California D.A.* 2:332 (Aug.) 1935.

2. Humphrey, Karl, Removable Bridge Using a Hook Attachment in a Tinker Pontic (Technic Developed by George Hollenback, D.D.S., L.A.) *J. South. California D. A.* 2:372 (Sept.) 1935.

Another simple and satisfactory attachment for unilateral dentures was designed by Lawrence Dunn, of Santa Barbara, Calif., and E. R. Hart, of St. Louis. Dr. Dunn conceived the idea of inserting an 18 gage wire into the mesial and distal embrasures of a tooth on the opposite side of the arch from the missing teeth. Dr. Hart carried this idea further by attaching these wires to a lingual clasp with two rest lugs on the occlusal surface (Fig. 6, right). Many variations of this attachment have been used with great satisfaction.

Unfortunately, some dentists have made use of a cast clasp with an occlusal rest on the distal surface of the last tooth on the opposite side of the arch from the missing teeth. Employment of this type of unilateral anchorage results in necessity for a very early bilateral denture.

In conclusion, the use of the proper stressbreaker on free end saddles to relieve the torque and stress caused by mastication and swallowing preserves the abutment teeth in a healthy condition for the longest period of time. It is our obligation to humanity to protect the natural teeth by whatever means is available to dental science. Of course, we must educate the public to early dental care and a regular inspection, if we expect to attain the best results.

▲

Science and Religion.—Throughout the earth, there is the spiritual yearning for more abundant living. Men now believe that the physical base for the life of the spirit is attainable. They hold that science has made this possible. They turn in increasing number to religion for the insight and the power to realize the spiritual life now about to be freed from the limitations of physical hunger, disease, and poverty.

Science and religion are essential to man's salvation. This truth both science and religion have come to realize.—*G. Bromley Oxnam, "Religion and Science in Accord," The Annals of the American Academy of Political and Social Science 256:141, March 1948.*

EFFECTS OF TIME AND TEMPERATURE ON POLYMERIZATION OF A METHACRYLATE RESIN DENTURE BASE

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THE MOST significant properties of a denture base are its accuracy in dimensional reproduction, its stability and its strength. In order to use the material intelligently, one should know its possibilities and the proper technic for realizing these possibilities. In other words, he should know whether the material possesses sufficient strength and accuracy to be practical for the application and how variations in the time and temperature of curing the resin will affect its physical properties.

This report summarizes an attempt to discover the properties of one material (Vernonite, powder-liquid, pink). This denture base consisted of synthesized monomeric methyl methacrylate with polymers of methyl methacrylate and ethyl methacrylate, colored with less than 0.5 per cent of inorganic pigments and opacifiers. The material also contained hydroquinone (0.002 per cent) as an inhibitor and benzoyl peroxide (0.2 per cent) as a catalyst. Although the results obtained may be applicable, in a general way, to all acrylic resin denture bases, any modification in the composition of the material may alter its mechanics of polymer formation and, therefore, its behavior under the specified conditions. Plasticizers and accidental impurities are not the only additions which will affect the polymerization cycle. Materials containing other resins as copolymers, for instance, will act differently; and the behavior of acrylic resins will be affected by a minute shift in the amount of catalyst or inhibitor present.

The specimens used to observe linear dimensional change in the resin were flat plates 1.8 to ±0.2 mm. thick and approximately 60 mm. square. They were cured in a press with one side of the specimen against a stainless steel plate cross-hatched at 10 mm. intervals by accurately engraved lines 50 mm. in length (Fig. 1). Accuracy of measurement is possible only with a line of well defined edges or center. These lines were 30 to 40 microns in width. Their V-shape in the steel was reproduced in the resin as an inverted *V* with a clearly defined center point on which to focus the microscope for measuring. Changes in dimension were measured with a comparator microscope which had been calibrated against a certified line standard. Extreme care had to be used in the measurements because of the small changes in dimension which occurred. A molding change of –0.3 per cent is only 0.15 mm. in a 50 mm. line. Observations by the method described are believed to be accurate to ±2 microns.

The values reported here are comparative only, as no correction was applied for the expansion of the metal plate. A method of correction was used by Skinner and Cooper,[1] but it was not

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The author is employed by the Vernon-Benshoff Company, Pittsburgh, Pa.

1. Skinner, E. W., and Cooper, E. N., Physical Properties of Denture Resins: Part I. Curing Shrinkage and Water Sorption. *J.A.D.A.* 30:1845 (December) 1943.

applied to these data. Because the same mold and the same material were used for all specimens, this error was assumed to be constant.

Measuring the curing shrinkage of a plastic against two plates with widely different coefficients of thermal expansion is a simple way to determine the hardening temperature of a resin. This has been demonstrated by curing plates against stainless steel and pyrex glass similarly ruled. The curing shrinkage of a sample processed against glass was 0.45 per cent and against steel, 0.38 per cent, with the values corrected to 37 C. for comparison. Using a linear thermal expansion coefficient of 3.3×10^{-6} per centigrade degree for pyrex and 16×10^{-6} for stainless steel, the point at which the material was firm enough to retain its form was 94 C., if it is assumed that the differential expansion of the two plates can be used to determine the hardening temperature. A plate cured against steel at 71 C. (160 F.) constant temperature had a curing shrinkage of 0.27 per cent, which checks with the computed value.

The importance of the temperature at which measurements are made is indicated by the high coefficient of linear thermal expansion for methyl methacrylate, 81×10^{-6} per centigrade degree, as reported by the Bureau of Standards.[2] Either all measurements should be made at the same temperature, or they should be corrected to some standard after reading at room temperature. The magnitude of variations which may be introduced by fluctuations in room temperature is demonstrated by the range of 21 to 33.5 C. registered by the laboratory thermometer during this study. This spread of 12.5 centigrade degrees in room temperature results in a difference of 0.051 mm. or 0.1 per cent in a 50 mm. line. This represents a possible error

2. Souder, Wilmer, and Paffenbarger, G. C., *Physical Properties of Dental Materials.* U. S. Department of Commerce, National Bureau of Standards, Washington, D. C.: U. S. Government Printing Office, 1942.

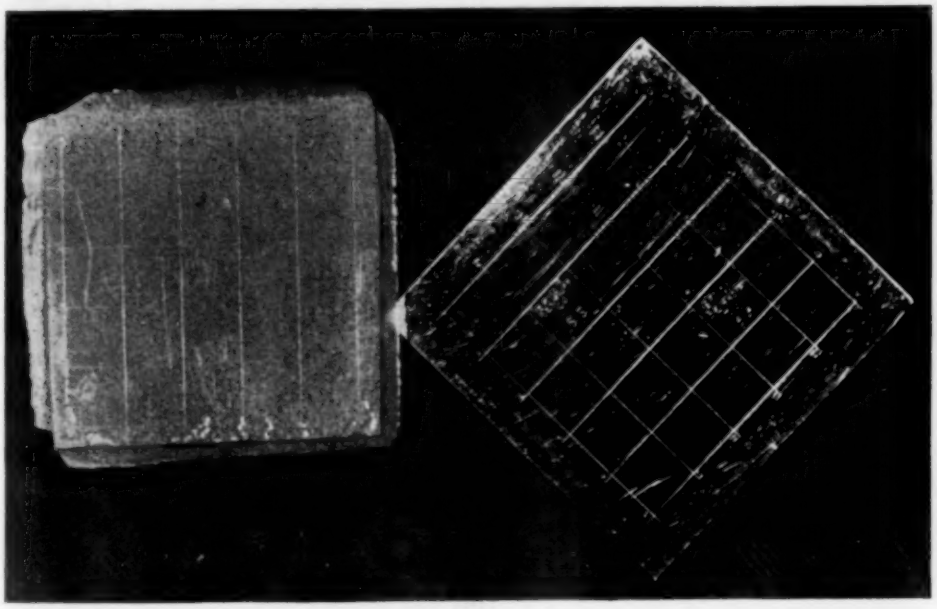

Fig. 1.—Flat plates used for observing linear dimensional change in the resin. Accurately ruled stainless steel (left) and test piece of methacrylate resin denture base cured against it (right)

greater than the difference in molding shrinkage between specimens cured by varying technics, and equal to the net shrinkage of any specimen which has been kept in water at body temperature for two weeks. Applying a correction which does not allow for the thermal expansion of the steel mold admittedly is not the ultimate in accuracy; but it does avoid many distracting and meaningless wobbles in the curve and produces a truer picture of the linear behavior of the resin, by eliminating the random error of the temperature of measurement and leaving only the constant error of the metal expansion.

Consideration of all these factors makes it necessary to interpret with caution the results of many tests of shrinkage and subsequent fit of the denture form. Most of these tests fail to take into account the temperature of storage and of observation of the denture and of the model, as well as the expansion cycle through which the model has passed while the denture was being cured.

It is realized, of course, that the values obtained for straight lines on flat plates cannot be applied directly to the irregular outline and curving surfaces of the denture because of the difference in the strains introduced in the two forms during molding. However, it is felt that the denture form does not adapt itself to this type of study, and that data on a material, as such, are always significant and useful for the purposes of comparison.

Curing Technics

Figure 2 illustrates the results of nineteen months' observation of the type of sample already described. For this study,

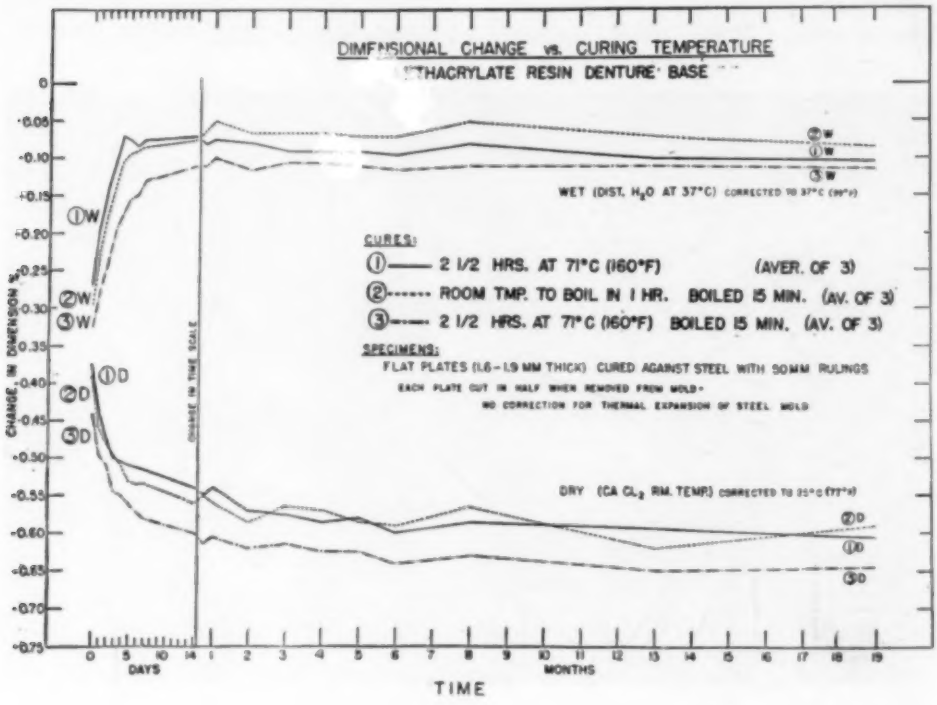
DIMENSIONAL CHANGE vs. CURING TEMPERATURE
METHACRYLATE RESIN DENTURE BASE
WET (DIST. H2O AT 37°C) CORRECTED TO 37°C (99°F)
CURES:
① —— 2 1/2 HRS. AT 71°C (160°F) (AVER. OF 3)
② ------ ROOM TMP. TO BOIL IN 1 HR. BOILED 15 MIN. (AV. OF 3)
③ —— 2 1/2 HRS. AT 71°C (160°F) BOILED 15 MIN. (AV. OF 3)
SPECIMENS:
FLAT PLATES (1.6 - 1.9 MM THICK) CURED AGAINST STEEL WITH 50MM RULINGS
EACH PLATE CUT IN HALF WHEN REMOVED FROM MOLD
NO CORRECTION FOR THERMAL EXPANSION OF STEEL MOLD
DRY (CA Cl2 RM. TEMP.) CORRECTED TO 25°C (77°F)
CHANGE, IN DIMENSION %
DAYS
MONTHS
TIME

Figure 2

Table 1—Effect of cure on dimensional change and water sorption in methacrylate resin denture base (unplasticized) pink powder-liquid

Method of cure	Linear dimensional change						Change in weight			
	Wet with water at 37 C. (99 F.)			Dry (desiccator) 25 C. (77 F.)			Wet with water at 37 C. (99 F.)		Dry (desiccator)	
	0 days, per cent	2 wk., per cent	19 mo., per cent	0 days, per cent	2 wk., per cent	19 mo., per cent	2 wk., per cent	19 mo., per cent	2 wk., per cent	19 mo., per cent
71 C. (160 F.) for 2½ hr....	−0.27	−0.07	−0.11	−0.38	−0.54	−0.61	+1.18	+1.18	−0.51	−0.54
Room temperature to boiling point in 1 hr.; boiled 15 min.....	−0.29	−0.08	−0.09	−0.39	−0.56	−0.59	+1.33	+1.42	−0.59	−0.65
71 C. (160 F.) for 2½ hr.; boiled 15 min.....	−0.34	−0.11	−0.12	−0.44	−0.60	−0.64	+1.38	+1.47	−0.47	−0.60

Specimens: Flat plates 60 mm. square by 1.8±0.2 mm. thick, cut in half when removed from mold. Linear change based on fiducial line 50 mm. in length on stainless steel at room temperature.

nine specimens of comparable thickness were made, three by each of the following technics:

1. 71 C. (160 F.) for two and a half hours.

2. Room temperature to boiling point in one hour; boiled for fifteen minutes.

3. 71 C. (160 F.) for two and a half hours; boiled for fifteen minutes.

Curing was done in a hydraulic press under pressure of approximately 450 pounds, simulating that in a dental flask. Pressure was not released until the platens had returned to room temperature, and then the samples were removed and measured immediately. Next they were cut in half, weighed, and one piece of each sample was stored in distilled water at 37 C. (99 F.), the other in a (calcium chloride) desiccator at room temperature. They subsequently were weighed and measured, as indicated, daily for the first week, each week for a month, each month for the first six, and then at lengthening intervals for a total of nineteen months' observation. Measurements were made at room temperature and then corrected to 37 C. (99 F.) for the wet and 25 C. (77 F.) for the dry specimens. The two temperatures were used for correction because, with the conditions of humidity, they seemed to represent the extremes to which a practical denture might be subjected during its useful life; that is, moisture in a patient's mouth or dryness at room temperature.

The most obvious conclusion to be drawn from Figure 2 is that the dimensions of the specimens were not altered significantly by the variations in curing technic. The maximum difference between any two groups, immediately on removal from the mold, was only 0.07 per cent. In a 50 mm. line, this was 0.035 mm. or 0.0014 inches (Table 1).

All specimens behaved similarly when stored in water, gaining in dimension rapidly during the first week and reaching their maximum accommodation in approximately fourteen days. At the end of two weeks, the greatest difference between any two groups was 0.04 per cent.

To complete the comparison, samples made by a longer low temperature cure, nine hours at 71 C. (160 F.), also were

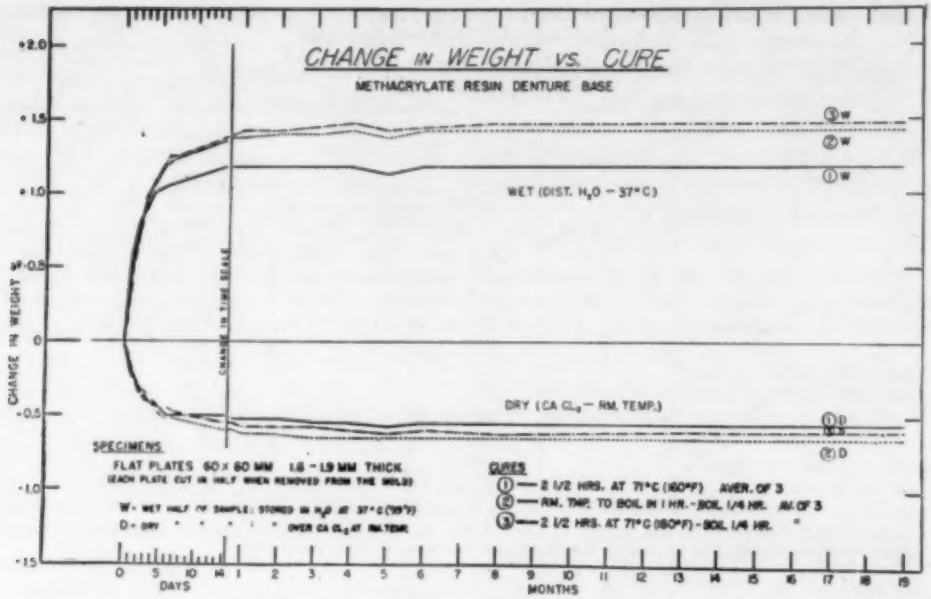
CHANGE IN WEIGHT vs. CURE
METHACRYLATE RESIN DENTURE BASE
WET (DIST. H2O – 37°C)
DRY (CA Cl2 – RM. TEMP.)
CHANGE IN WEIGHT
CHANGE IN TIME SCALE
SPECIMENS
FLAT PLATES 60 x 60 MM 1.6 - 1.9 MM THICK
CURES
2 1/2 HRS. AT 71°C (160°F) AVER. OF 3
RM. TMP. TO BOIL IN 1 HR. - BOIL 1/4 HR. AV. OF 3
2 1/2 HRS. AT 71°C (160°F) - BOIL 1/4 HR.
DAYS
MONTHS

Figure 3

measured but were not included in the graph because they were started much later. Their molding shrinkage was in the same range, and it is expected that their subsequent behavior also will be similar to that of any other well cured specimens.

Dry samples followed the same pattern as those in the wet group, but in a reverse direction. They shrank rapidly during the first week, reached a maximum in about fourteen days and then remained stable. At the end of the first two weeks, the net shrinkage from the mold size was approximately five times as great in the dried specimens as that of the same material when thoroughly wet and at body temperature.

A limiting amendment should be added to the conclusion which has been oversimplified for the sake of emphasis. Variations in curing technic do not alter the dimensional behavior of an acrylic resin denture base providing substantial polymerization has occurred. By methods now available, substantial polymerization can be demonstrated only indirectly by the presence in the resin of satisfactory physical properties. Tests of transverse strength resulted in the conclusion that two and a half hours at 71 C. (160 F.) is not sufficient time to produce substantial polymerization in sections 3 mm. or less in thickness, although on visual inspection they appear quite hard. After thirteen months, one of these specimens had warped so that it was no longer flat and an accurate measurement could not be made. From that time, line 1 in Figure 2 represents an average of two specimens.

Differences in behavior due to variations in formulation of materials, all of which justly can be called "pure, unplasticized acrylic denture resin," were demonstrated by the concurrent tests of the gel form (premixed monomer-polymer cake). By the end of six months, all of the gel specimens cured at 71 C. (160 F.) for two and a half hours were too warped to measure. The other technics, however, produced samples of stability

equal to that of the powder-liquid. There also was noted a slightly higher average shrinkage of the gel form immediately after molding. However, after the period of linear expansion in water at body temperature, the difference between the average for the two forms was too slight to be significant (0.01 per cent).

Observation of the change in weight of these same linear specimens gave a long-time picture of the water sorption and solubility of the material cured by different technics (Fig. 3). The pattern of these curves duplicated generally the dimensional behavior. The weight of both wet and dry samples became stable after two to three weeks, with little difference in gain or loss among the three groups. The insufficiently cured gel specimens previously referred to, however, began to lose weight in water at the end of six days and, at the end of nineteen months, were within 0.24 per cent of their weight immediately after curing.

Transverse Strength

The effect of time and temperature of polymerization on the physical properties of the resin becomes much more apparent when the transverse strength of the resulting material is considered. The significant temperature, however, is not that of the water bath, the mold or the

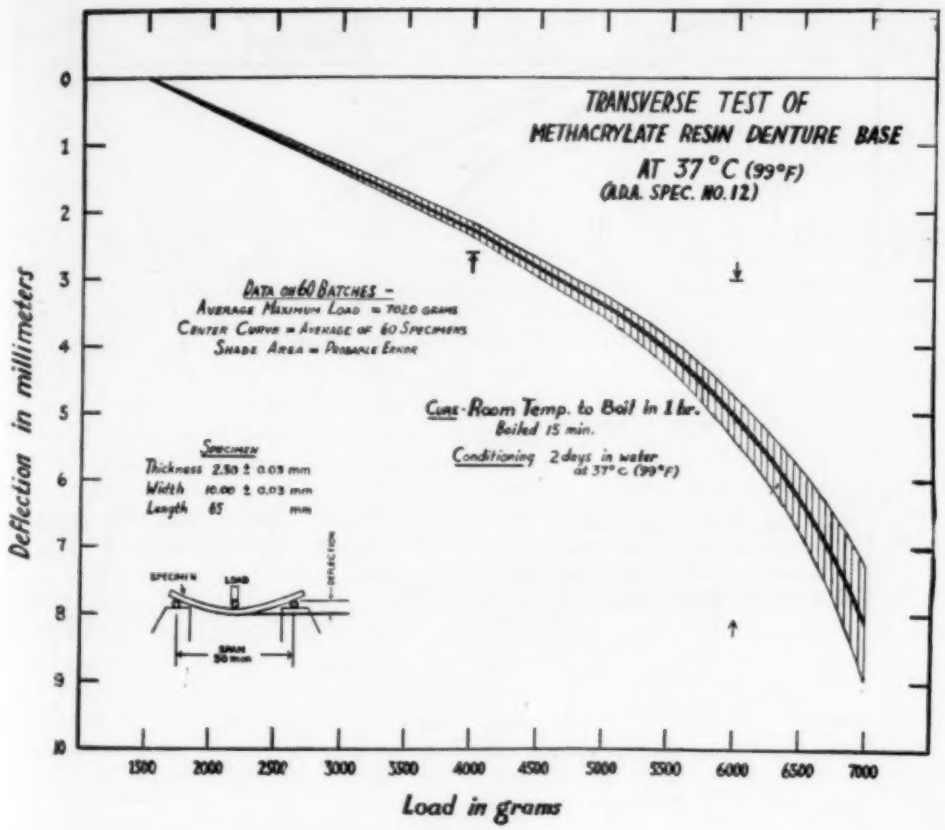

Figure 4

press, but the temperature reached within the resin during polymerization. This temperature is dependent not only on the temperature of the water bath, but also on the rate of heat-up during the cure and on the mass and form of the sample. Tuckfield, Worner and Guerin[3] also have discussed the effect of the size of the sample and the rate of temperature rise on the peak reached within the piece.

3. Tuckfield, W. J., Worner, H. K., and Guerin, B. D., Acrylic Resins in Dentistry. Part II. Their Use for Denture Construction. *Austral. J. Den.* 47:1 (March) 1943.

Temperature determinations for this study were made by means of iron-constantan themocouples of B. & S. 28 gage wire imbedded in the specimens and suspended in the water baths. Some temperatures were measured with a portable Leeds and Northrup potentiometer and the rest with a Brown Electronik recording potentiometer. The latter automatically records the temperatures of three thermocouples on a chart every few seconds.

The transverse test used was that set up by A.D.A. Specification 12. The

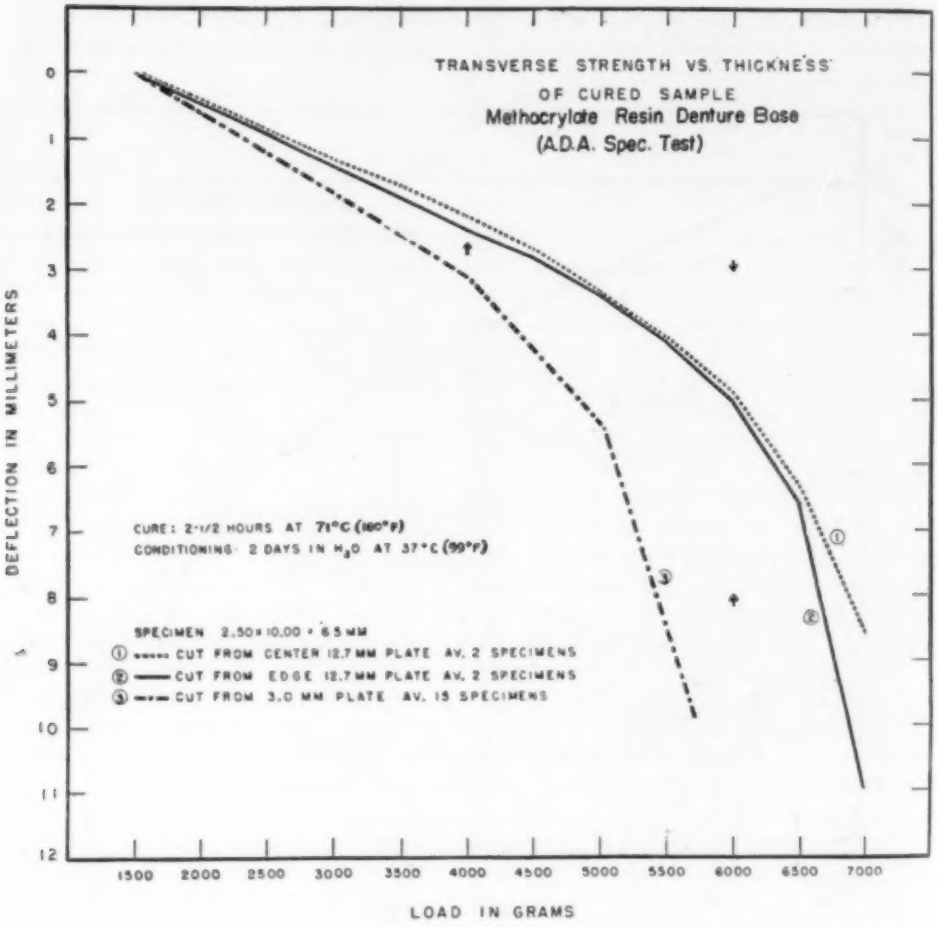

Figure 5

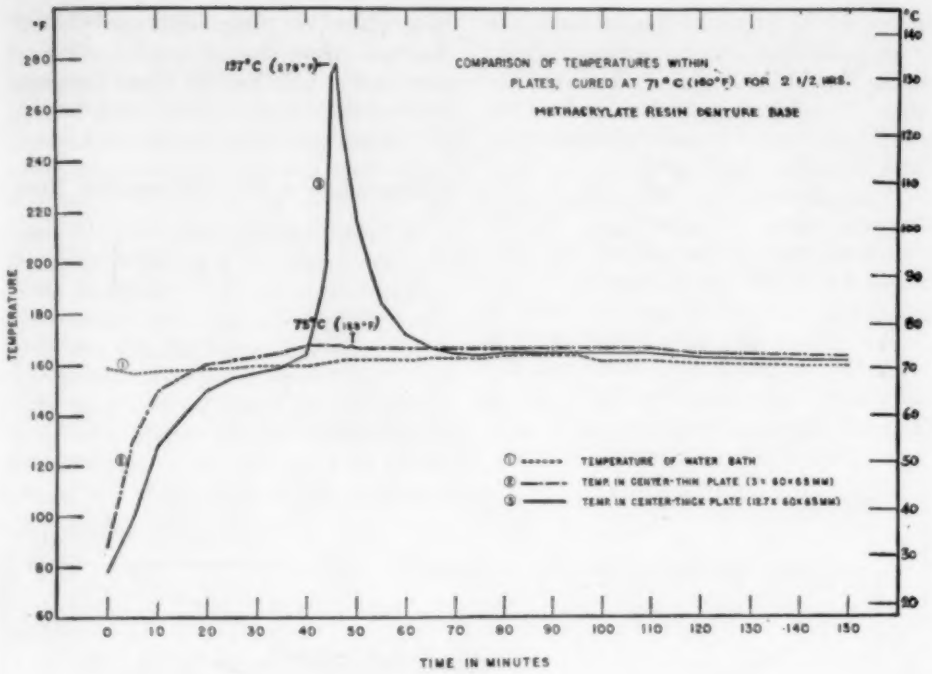
COMPARISON OF TEMPERATURES WITHIN PLATES, CURED AT 71°C (160°F) FOR 2 1/2 HRS.
METHACRYLATE RESIN DENTURE BASE
137°C (279°F)
75°C (167°F)
TEMPERATURE
TIME IN MINUTES
① TEMPERATURE OF WATER BATH
② TEMP. IN CENTER-THIN PLATE (3 × 60×65 MM)
③ TEMP. IN CENTER-THICK PLATE (12.7 × 60×65 MM)

Figure 6

specimen size was 2.50 ± 0.03 by 10.00 ± 0.03 by 65 mm., tested over a 50 mm. span. The specification[4] states that the material is to be "cured according to the directions which accompany the package." It also specifies the tolerance on the size of the specimen; but for uniform procedure and results, it will be shown that it also should define the size of the sample from which the specimen is cut. The method of cutting the sample should receive consideration, too. Coolants, cutting lubricants, types of abrasive wheels and the speed at which they are turned all have a significant effect on the strength of the specimen and should be standardized.

Figure 4 is a typical curve obtained from the results of tests on sixty batches of similar material cured by one technic. Specimens were cut from plates 3 mm. thick which had been processed in plaster in dental flasks according to the usual dental procedure. The probable error, as computed for each point on the curve, is indicated by the shaded section. The graph demonstrates the limits within which the results of this test were reproduced when presumably similar material was used, and all factors of curing, sample size and specimen preparation were standardized accurately.

Experiments with variations in the size of the sample were prompted by the observation that, although many dentures were being cured with evident success at 71 C. (160 F.) for two and a half hours, transverse samples cut from plates 3 mm. thick cured by this technic failed to meet the A.D.A. specification. The lowest of the three lines in Figure 5 shows the average for fifteen such speci-

4. Sweeney, W. T., and Paffenbarger, G. C., Tentative A.D.A. Spec. 12 for Denture Base Material, Acrylic Resin or Mixtures of Acrylic and Other Resins. *J.A.D.A.* 28:325 (February) 1941.

mens. The material broke under an average load of only 5,700 Gm. It had a deflection at 4,000 Gm. in excess of the limit and had sagged farther at 5,500 Gm. than it should have at 6,000 Gm., had it reached that load.

The other two lines demonstrate what happens when all other factors are unchanged, but the sample is increased from 3 mm. or approximately ⅛ inch in thickness to 12.7 mm. or about ½ inch.[5] These also were cured at 71 C. (160 F.) for two and a half hours. The specimens were prepared by removing 5 mm. in thickness from the top and bottom of the block and cutting the strips to size from the center section. Whether the specimens came from the edges or the center of the middle layer, they now exceeded, in both strength and rigidity, the requirements of the specification.

5. *Vernonite Work Bench*, Vol. 3, 1944.

Polymerization Temperatures and Time

A more striking difference between the two samples of unequal thickness is demonstrated by the record of their thermal behavior as recorded by thermocouples during polymerization (Fig. 6). Line 1 represents the temperatures in the water bath. Line 2 represents temperatures in the center of a plate 60 by 65 by 3 mm. thick, in plaster, in a bronze dental flask. It is one of two

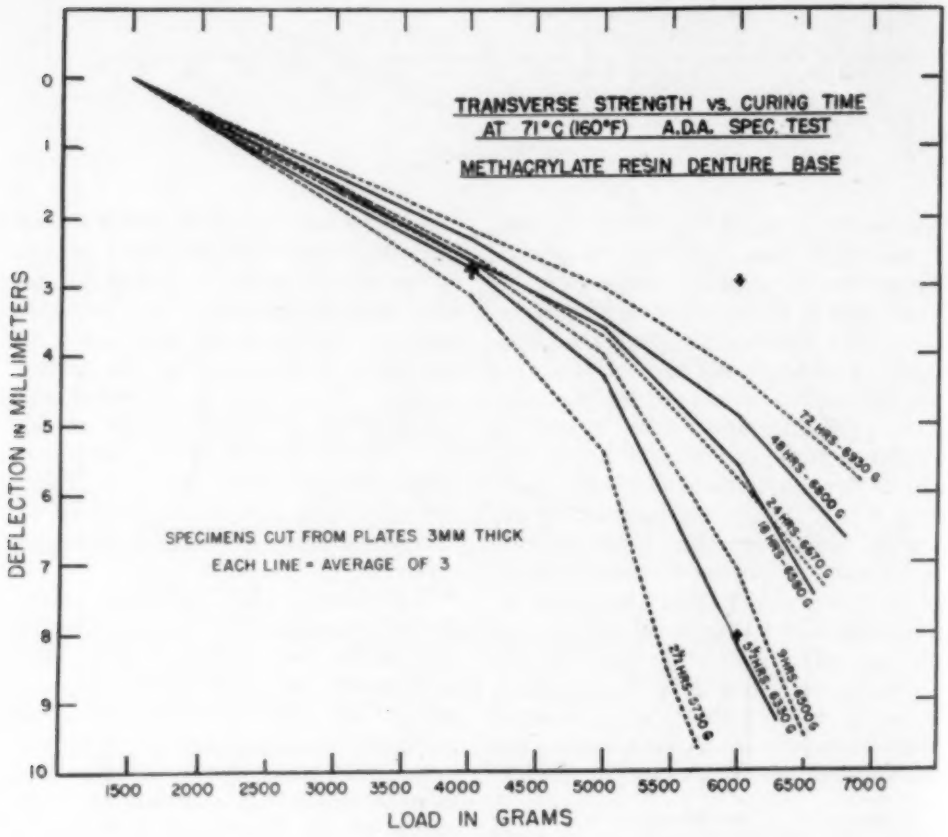

Figure 7

flasks in the same spring compress. The other flask contains a similarly invested block 60 by 65 by 12.7 mm. thick, with line 3 representing the temperature in its center. Powder and liquid of the same batches were used, and every effort was made to keep all conditions of mixing and packing as uniform as possible.

The temperature in the thin plate equaled that of the water in about eighteen minutes, but it never exceeded the ambient temperature by more than 8 F. degrees. The plaster had been able to conduct the exothermic heat away from the surfaces of the thin plate so efficiently that a high peak temperature could not be built up within the resin.

The pattern of line 3 is the result of the low thermal conductivity of methyl methacrylate. The center of the thicker block did not reach the temperature of the water until thirty-seven minutes had passed. Once it had reached the temperature where rapid polymerization began, the exothermic heat was dissipated slowly, and a peak of 137 C. (278 F.) was reached.

On removal from the flask, both these samples appeared sound and well cured. Transverse tests, as already shown, dem-

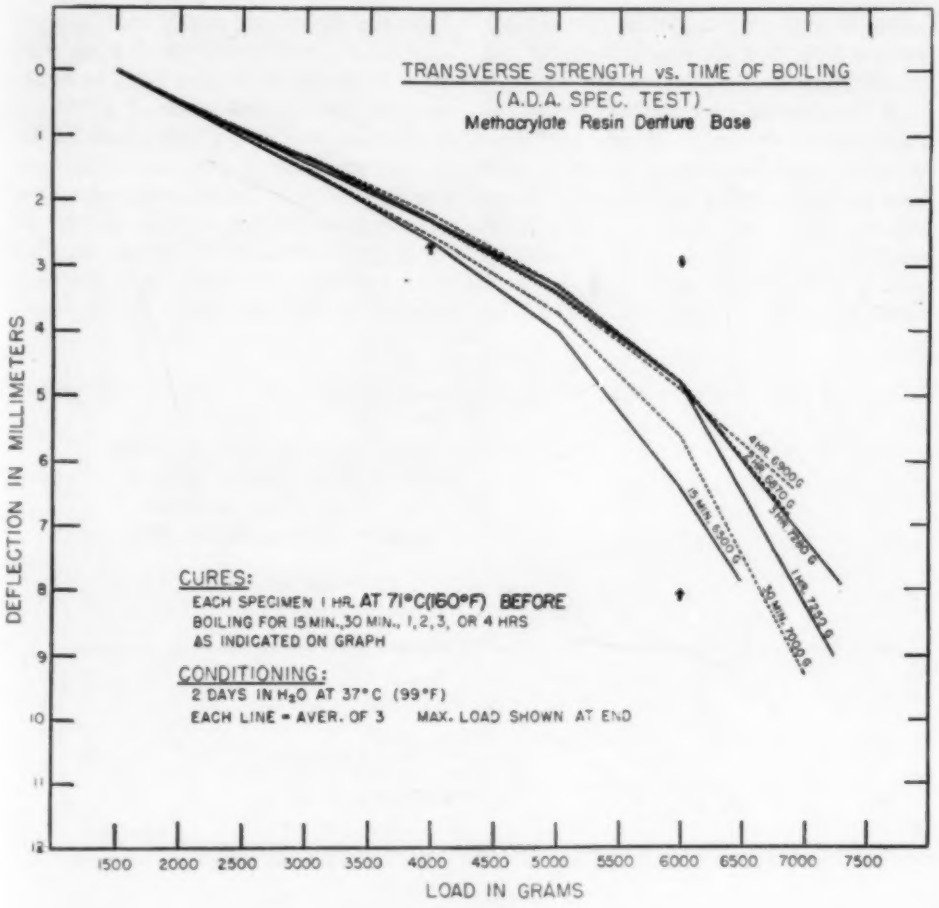

Figure 8

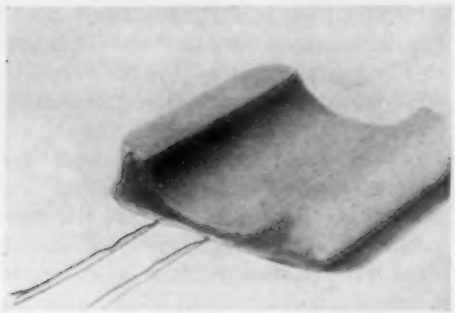

Fig. 9.—Arched sample of denture material used to determine temperature during polymerization and strength of resin in various portions of the sample of unequal thickness

onstrated the 3 mm. plate to be lower in strength and rigidity, while the heavier sample exceeded the requirement of the specification.

If the physical properties of the cured material are the result of time and temperature together, then it would appear that the area under lines 2 and 3 is the significant factor. Could its low "ceiling" be compensated for by extending line 2 to the right; and if so, by how much must the time at 71 C. (160 F.) be increased to produce properties comparable to the strength of the thick plate which had reached a peak of 137 C. (278 F.)?

Six more 3 mm. plates were prepared uniformly from the same batch of material and placed in the 71 C. (160 F.) water bath at the same time. They then were removed after periods of 5½, 9, 18, 24, 48 and 72 hours, respectively. The results are charted on the graph in Figure 7.

It will be seen that the extension of time of cure caused a continuous change in the character of the resin produced. In general, both stiffness and breaking load increased in the same order as the increase in curing time. All samples cured for nine hours or more conformed to A.D.A. specifications, both in deflection at the critical loads of 4,000 and 6,000 Gm. and in the maximum load.

The moderate improvement in breaking load shown by the forty-eight and seventy-two hour specimens should not be interpreted as an advantage in a denture material, inasmuch as it is accompanied by a lack of flexibility which

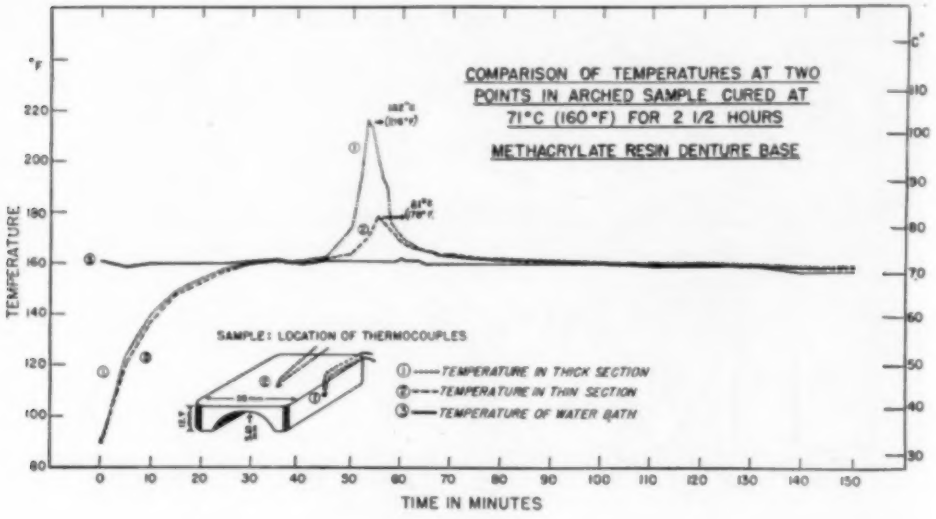
COMPARISON OF TEMPERATURES AT TWO POINTS IN ARCHED SAMPLE CURED AT 71°C (160°F) FOR 2 1/2 HOURS
METHACRYLATE RESIN DENTURE BASE
TEMPERATURE
TIME IN MINUTES
SAMPLE: LOCATION OF THERMOCOUPLES
①——TEMPERATURE IN THICK SECTION
②---TEMPERATURE IN THIN SECTION
③——TEMPERATURE OF WATER BATH

Figure 10

would make for a brittle denture. For practical application to the denture form, the resin produced in the 3 mm. sample by nine hours at 71 C. (160 F.) seems to have the best over-all physical properties.

On this basis, it was believed that the overnight processing at 71 C. (160 F.) is the technic of choice. It was recognized, however, that this long curing period might not always be feasible, and so the investigation was continued in an attempt to arrive at a shorter cycle with some justification to recommend it.

Inasmuch as the incompletely cured samples were characterized by a continued loss of weight, even in water, it was believed that the loss represented either monomer, or polymer molecules of such short chain lengths as to be very unstable. It was demonstrated that these unstable constituents could be polymerized further by boiling, even several days after the original cure. Two of

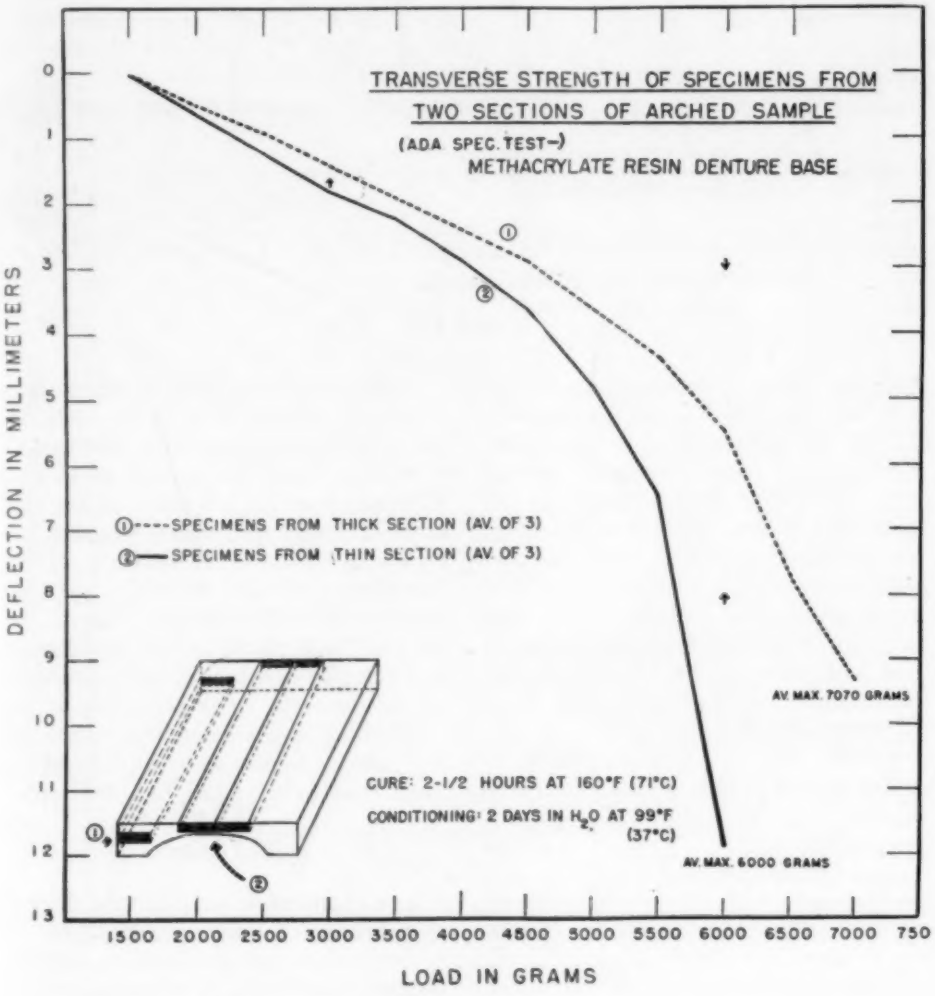

Figure 11

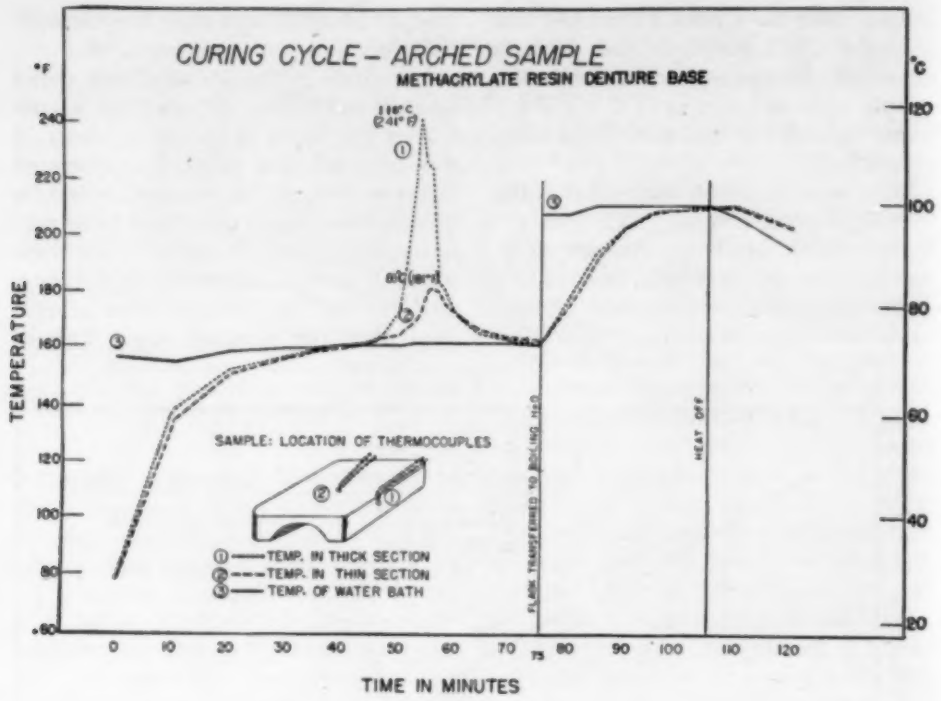

Figure 12

the 3 mm. plates were removed from the flasks after two and a half hours at 71 C. (160 F.) and exposed to room temperature and room humidity for two days. They then were replaced in the flasks and boiled for fifteen minutes. Six specimens cut from these samples were comparable in strength to the material which had remained for nine hours at 71 C. (160 F.). The breaking load had increased to 6,550 Gm., and the material was stiff enough to meet the specification.

Another series of tests was made by curing for one hour at 71 C. (160 F.) and then boiling the 3 mm. plates for various lengths of time. This technic was chosen rather than one involving raising the water bath from room temperature to boiling in a specified time in order to avoid the difficulty of obtaining a uniform and reproducible temperature rise.

Flasks containing 3 mm. samples were placed in the kettle at 71 C. (160 F.) for an hour and then were transferred to boiling water for periods of 15 and 30 minutes and 1, 2, 3 and 4 hours. Results of tests from these samples are shown in Figure 8. As boiling time was increased up to one hour, the resin became stiffer and somewhat stronger. After one hour, boiling did not change significantly either of these characteristics of the resin. The deflection at the two critical loads remained essentially the same, and the variations in maximum load were within expected limits.

Arched Samples

In an attempt to simulate the uneven distribution of bulk in a denture, an arched sample was produced so that the temperature during polymerization and the strength of the resin in various por-

tions of the sample could be determined (Fig. 9). The flat surface had approximately the same dimensions as the 3 mm. plates. The edges were 12.7 mm. thick along each side, however. The arch began about 10 mm. inside of each edge and curved up to a center section 3.0 to 3.1 mm. thick.

Several samples were prepared in the usual manner in denture flasks with thermocouples inserted in the center of the thin section and in the center of the heavy edge portion. Figure 10 shows a typical thermal reaction when the samples were immersed in a water bath at 71 C. (160 F.) for two and a half hours. At the end of about fifty minutes, the temperature in the heavy section had reached a peak of 102 C. (216 F.). Heat conducted from the heavy edges had produced a high of 81 C. (178 F.) in the thin center section, a little higher than that recorded for a plate 3 mm. in thickness throughout. From previous experience, transverse specimens cut from the thicker portions should be expected to have satisfactory strength and rigidity. Specimens from the center would be expected to fall below specification limits.

It seemed as though raising the temperature of the water bath slightly should push the thin section to 100 C. (212 F.) without a dangerous increase in the peak temperature of the thick portion. An ambient temperature of 77

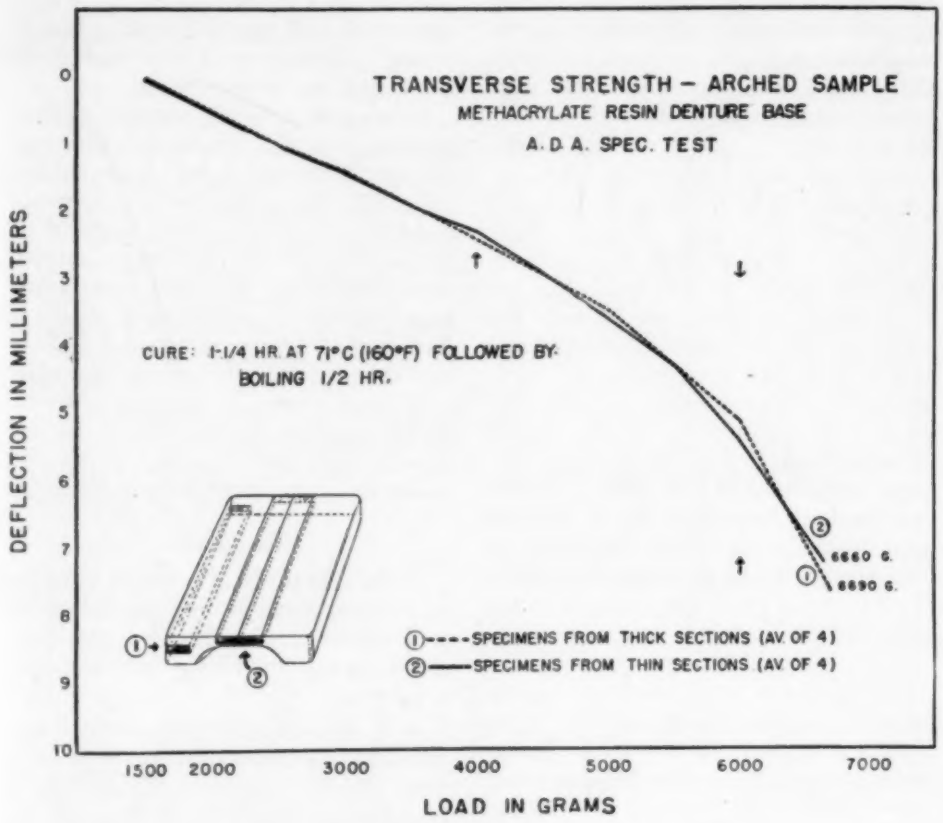

Figure 13

C. (170 F.) was tried several times, and always with disastrous results. The thin section went a little above 100 C. (212 F.), but any advantage was counteracted by the consistent appearance of large bubbles in the ridges. The highest temperature here was 143 C. (290 F.), which might not seem sufficient to cause such bubbling when it is remembered that the ½ inch block in an ambient temperature of 71 C. (160 F.) reached 137 C. (278 F.) and yet it was sound and bubble-free.

The significant fact appears to be that the peak of exothermic reaction in both the ½ inch block and the arched sample at 71 C. (160 F.) occurred after approximately fifty minutes, during which time enough polymer probably had been formed to raise the boiling range of the mixture well above any peak temperature which might be attained. In the 77 C. (170 F.) water bath, the peak temperature was reached after only twenty-six minutes. The outer surface of the sample may have polymerized and become rigid, while the inner portion still contained so many monomer or short-chain molecules, or both, that the boiling range of the mixture was below 143 C. (290 F.). Vapor was formed, the block could not contract and bubbles resulted. A high temperature, of itself, probably will not produce bubbles. The rate of temperature rise in the sample must be controlled so that the high temperature is reached after sufficient polymer has been formed to raise beyond the exothermic peak the boiling range of the mixture at the pressure of molding. This seems to be in agreement with the report of Taylor.[6]

After several failures to produce a sound specimen at any higher temperature, the arched samples cured at 71 C. (160 F.) were cut in test strips. Transverse strengths of specimens from different portions of the sample were approximately as predicted (Fig. 11). The thin section was not adequately cured. To give the thin section maximum strength, the sample either must remain for nine hours or more at 71 C. (160 F.) or it must be boiled.

Successful Curing Cycle

Figure 12 illustrates a curing cycle likely to preclude bubbles in the thick section and to provide the necessary strength in the thin portion if the nine hour curing time were not feasible. In about fifty minutes the heavy ridges reached their peak temperature; and in an hour and a quarter both sections had returned to the temperature of the water bath. The flask was transferred to boiling water for half an hour, the heat turned off and the flask removed after a total elapsed time of two hours from the beginning of processing.

Specimens from all portions of samples cured by this two stage technic met the specification for the transverse test (Fig. 13). The thick section was free of bubbles and had not been harmed by the boiling after its polymerization had been completed. The thin section had acquired satisfactory strength, which it had lacked before boiling. The two curves are practically indistinguishable.

Table 2 summarizes and compares the effects on transverse strength of the previously described variations in the size, shape and cure of the sample.

Conclusions

From this study of a single material of known formulation, the following conclusions, applicable in a general way to all methacrylate resin denture bases, are drawn:

1. A substantially polymerized, unplasticized methacrylate resin denture base, after two weeks in water at body temperature, has a linear dimensional change of the order of −0.1 per cent,

6. Taylor, P. B., Acrylic Resins: Their Manipulation. *J.A.D.A.* 28:373 (March) 1941.

Table 2—Effect of size, shape and cure of sample on transverse strength of methacrylate resin denture base (unplasticized) pink powder-liquid

Type sample	Thickness of section, mm.	Method of cure	Number of specimens	Deflection, mm.		Maximum load, gm.
				4,000 gm.	6,000 gm.	
Flat plate.....	3	Room temp. to boiling point in 1 hr.; boiled 15 min.....	60	2.3	5.0	7,020
Flat plate.....	3	71 C. (160 F.) for 2½ hr.....	15	3.1	—	5,700
Flat plate.....	3	71 C. (160 F.) for 9 hr.....	3	2.6	7.1	6,500
Flat plate.....	3	71 C. (160 F.) for 1 hr.; boiled ½ hr..	3	2.5	5.6	7,000
Flat plate.....	3	71 C. (160 F.) for 2½ hr.; 2 days later, boiled 15 min.....	6	2.6	6.2	6,550
Arched sample.	3	71 C. (160 F.) for 2½ hr.....	3	2.9	11.9	6,000
Arched sample.	13	71 C. (160 F.) for 2½ hr.....	3	2.4	5.5	7,070
Arched sample.	3	71 C. (160 F.) for 1¼ hr.; boiled ½ hr.....	4	2.3	5.4	6,660
Arched sample.	13	71 C. (160 F.) for 1¼ hr.; boiled ½ hr.....	4	2.4	5.1	6,690
A.D.A. requirement, Specification 12.....				Not more than 2.6	3–8	6,000

when no correction has been applied for the thermal expansion of the metal mold during curing. This has remained stable for a period of nineteen months. If the potentialities of the material are to be realized, however, each step in the technic of making a denture, from the impression on, and every accessory material used with it, must be of similar accuracy.

2. Inasmuch as the degree of polymerization attained is a function of time and the temperature within the resin, it is shown that an effective curing cycle must take into account the mass and form of the sample, the ambient temperature and the rate of temperature rise within the sample.

3. Because the size of the cured sample is a factor in the polymerization and the strength of transverse specimens, it is believed that the specification should define the dimensions of the sample from which such test pieces are cut, in order that uniform test results will be obtained in the same material.

▲

No Monoply.—The health of the American people and their health resources cannot and must not become a monoply—either of governments, private enterprise, or charitable organizations. Each of these great institutions has made incalculable contributions to American health.—*Leonard A. Scheele, "The Road Ahead in Public Health," Pub. Health Rep. 63:472, April 9, 1948.*

EVALUATION OF THE USE OF FLUORINE AS A CARIES CONTROL MEASURE: THE EFFECT OF TOPICALLY APPLIED FLUORIDES

John W. Knutson, D.D.S., Dr. P. H., Washington, D. C.

It has been demonstrated that the incidence of dental caries can be reduced by topical application of fluoride solutions to the teeth. The evidence supporting this conclusion is derived from direct clinical observations on man and animals and from laboratory investigations concerned with the chemical and biochemical action of fluorine on teeth and on dentin and enamel. It is the purpose of this article to review the evidence relating to the use of topical fluorides and to call attention to those factors that are known as well as those which await further research and clinical demonstration. This review will be concerned with a classification and evaluation of evidence according to broad categories —chemical research, research on laboratory animals and clinical studies on human beings—rather than with the time sequence of the results.

Chemical Research

Adsorption of Fluorides by Enamel.—When the presumptive evidence resulting from epidemiologic studies indicated that fluorides in communal water supplies effected a marked reduction in the prevalence of dental caries,[1] studies were begun to determine the manner of action of the fluorine. Initial laboratory investigations were concerned with studies on the enamel of sound and of carious teeth to determine whether there was a difference in their fluoride content. Armstrong and Brekhus[2] proceeded on the hypothesis that in a tooth with lowered resistance to caries over its entire surface, caries develops first wherever there is a local increase in the vigor of the caries-producing factors, or where there is a local decrease in the factors which make for resistance to decay. They determined that there is a significant difference in the mean fluoride content of sound and of carious tooth enamel.

Direct evidence that fluoride is adsorbed by enamel was presented by Volker and his associates.[3] Using radioactive fluorine, they found that enamel, bone, dentin and hydroxyapatite adsorb fluorine according to the Freundlich adsorption isotherm.

Norvold, Inglis and Armstrong[4] showed that the fluorine content of enamel is increased by immersion in a sodium fluoride solution.

Effect of Fluorides on Solubility.—Concurrently the measurement of the effect

Senior dental surgeon, chief, Dental Public Health Section, States Relations Division, U. S. Public Health Service, Washington, D. C.

1. Dean, H. T.; Arnold, F. A., Jr., and Elvove, Elias, Domestic Water and Dental Caries. V. Additional Studies of the Relation of Fluoride Domestic Waters to Dental Caries Experience in 4,425 White Children, Aged 12 to 14 years, of 13 Cities in 4 States. *Pub. Health Rep.* 57: 1155 (August 7) 1942.

2. Armstrong, W. D., and Brekhus, P. J., Possible Relationship Between the Fluorine Content of Enamel and Resistance to Dental Caries. *J. D. Res.* 17:393 (October) 1938.

3. Volker, J. F., and others, The Adsorption of Fluorides by Enamel, Dentin, Bone and Hydroxyapatite as shown by the Radioactive Isotope. *J. Biol. Chem.* 134:543 (July) 1940.

4. Norvold, R. W.; Inglis, J. H., and Armstrong, W. D., External Acquisition of Fluorine by Enamel. *J. D. Res.* 20:232 (June) 1941.

of fluorides on the solubility of tooth enamel was undertaken. Volker[5] reported that highly diminished enamel solubility, resulting from shaking powdered enamel in sodium fluoride solution, was not lost even after lengthy washing with saliva. Moreover, the natural surfaces of whole teeth were much less affected by acid after such treatment. The rapidity with which this action took place held much promise for the topical use of fluoride as a caries prophylactic procedure.

Thereafter the trend of laboratory investigation was to determine comparative adsorption qualities of a number of fluoride solutions, and the acidity of the solutions which would bring about maximum fluorine adsorption. Bibby[6] tested the effectiveness of various fluoride preparations in reducing tooth solubility by stirring powdered tooth enamel with various test agents. He found that the solubility-reducing effect of the fluoride was diminished in the high pH range, and that it was at its height when the acidity was pH 4 or below. Potassium fluoride was found to be as effective as sodium fluoride; ammonium fluoride gave comparable results, but calcium fluoride solutions were relatively ineffective.

Using powdered enamel and whole tooth sections, Phillips and Muhler[7] experimented further to determine the most effective acidity of the reagent solution, for topical application without damage to tooth tissue. They reported that the lower the pH of the sodium fluoride solution, the more effective it was in reducing enamel solubility. They concluded that a pH as low as 2.6 is not injurious to the tooth surface during the time of topical application. With the exception of a brief range above pH 5.5, there seems to be some decrease in the protective action of the fluoride as the pH of the solution increases.

Buonocore and Bibby[8] reported a study from which they concluded that the lead ion, alone or in combination with the fluoride ion, is very effective in reducing the solubility of enamel, and might be a more effective caries prophylactic than sodium fluoride.

Muhler and Van Huysen[9] also compared the inhibitive effect of sodium fluoride on enamel solubility with that of other reagents, and concluded that sodium fluoride was a satisfactory agent, but that other agents appeared to be as good or better. Tin fluoride was found to be the most effective in reducing the solubility of powdered enamel. With zinc and tin fluoride, unfiltered solutions were most effective, whereas in other tests, filtered reagent solutions protected enamel against solution by acid better than did unfiltered solutions.

Mechanism of Deposition. — The mechanism of fluorine deposition in enamel and other tooth substances is not known. Souder and Schoonover[10] have demonstrated, however, that decalcified surfaces of dentin can be remineralized by treatment with a calcium salt after a preliminary treatment with sodium fluoride. They concluded that the insoluble character of the remineralized surfaces was due to the deposition of insoluble calcium fluoride.

Armstrong and Knutson[11] examined

5. Volker, J. F., Effect of Fluorine on Solubility of Enamel and Dentin. *Proc. Soc. Exper. Biol. & Med.* 42: 725 (December) 1939.

6. Bibby, B. G., Effectiveness of Various Fluoride Preparations in Reducing Tooth Solubility. *J. D. Res.* 23:202 (June) 1944.

7. Phillips, R. W., and Muhler, J. C., Solubility of Enamel as Affected by Fluorides of Varying pH. *J. D. Res.* 26:109 (April) 1947.

8. Buonocore, M. G., and Bibby, B. G., The Effects of Various Ions on Enamel Solubility. *J. D. Res.* 24:103 (April) 1945.

9. Muhler, J. C., and Van Huysen, Grant, Solubility of Enamel Protected by Sodium Fluoride and Other Compounds. *J. D. Res.* 26:119 (April) 1947.

10. Souder, Wilmer, and Schoonover, I. C., Experimental Remineralization of Dentin. *J.A.D.A.* 31:1579 (December 1) 1944.

11. Armstrong, W. D., and Knutson, J. W., Increment of Fluorine Content of Enamel Following Topical Application of Fluorides to Teeth. *J. D. Res.* 24:192 (June-August) 1945.

the fluoride content of extracted teeth which previously had received from two to six topical applications of fluoride, and found no evidence that the fluoride content had been increased. However, the probability that an increase may have occurred only in the superficial layer was not investigated.

Rae and Clegg[12] conducted chemical studies on whole teeth, powdered enamel and calcium phosphate, suspended in lactic acid solution with or without added fluorides or oxalates. They concluded that in a solution of lactic acid and fluoride, enamel is decalcified by the acid and the calcium is redeposited as calcium fluoride.

Gerould[13] deduced from a study of normal and fluorosed teeth that fluorine, entering into a tooth during the formative period or period of calcification, is laid down, not in the form of calcium fluoride, but in the form of acid-resistant calcium fluorapatite, as a fine dispersion throughout the hydroxy- and carbonate apatites. On the other hand, fluorine entering into a tooth after the completion of calcification, is laid down in the form of acid-resistant calcium fluoride.

Research on Laboratory Animals

One of the earliest topical uses of fluorides was in an investigation by Sognnaes.[14] The effects of fluorine given by stomach tube were compared with the results of topical application of an aqueous fluoride solution to the mandibular right molars of rats. Sognnaes concluded that the topical method may increase resistance to incipient lesions in the enamel, whereas internal administration may increase resistance to destruction of fully formed dentin as well.

Sognnaes[15] reported another study on experimental rat caries. He applied potassium fluoride to the teeth of rats being fed a caries-producing diet, and demonstrated reduced dental caries in the experimental group as compared with the control group.

Some time later when the Syrian hamster came to be widely substituted for the rat in dental caries research, Keyes[16] conducted an investigation to compare the incidence of dental caries in a control group of animals with the incidence in a group given weekly two minute topical treatments with a 0.1 per cent solution of sodium fluoride. The results were inconclusive but suggested that the topical fluoride treatments afforded slight protection against dental caries.

Clinical Studies on Human Beings

The table presents a summary of the results reported on the effect of topical fluoride applications to the teeth of children.

Bibby[17-19] selected a group of 100 children aged 10 to 12 years, and each four months during the course of a two year period, applied a 0.1 per cent solution of sodium fluoride to the teeth in one mouth quadrant of each child. Untreated quadrants served as controls. The fluoride applications were preceded by a dental prophylaxis. He reported a 46 per cent reduction in caries incidence in fluoride-treated teeth of 90

12. Rae, J. J., and Clegg, C. T., The Effect of Sodium Fluoride on the Solubility of Calcium Phosphate, Tooth Enamel and Whole Teeth in Lactic Acid. *J. D. Res.* 24: 235 (October) 1945.

13. Gerould, C. H., Electron Microscope Study of the Mechanism of Fluorine Deposition in Teeth. *J. D. Res.* 24:223 (October) 1945.

14. Sognnaes, R. F., Effect of Local and Systemic Fluorine-Administration on Experimental Rat-Caries. *J. D. Res.* 19:287 (June) 1940.

15. Sognnaes, R. F., Effect of Topical Fluorine Application on Experimental Rat Caries. *Brit. D. J.* 70:433 (June 16) 1941.

16. Keyes, P. H., Dental Caries in the Syrian Hamster. III. The Effect of Topical NaF and Urea Applications on Caries Activity. *J. D. Res.* 25:469 (December) 1946.

17. Bibby, B. G., A New Approach to Caries Prophylaxis. *Tufts D. Outlook* 15:4 (May) 1942.

18. Bibby, B. G., The Effect of Sodium Fluoride Applications on Dental Caries. *J. D. Res.* 22:207 (June) 1943.

19. Bibby, B. G., and Turesky, S. S., A Note on the Duration of Caries Inhibition Produced by Fluoride Applications. *J. D. Res.* 26:105 (April) 1947.

children available for re-examination at the end of the first study year, and a 33 per cent reduction in 78 children available at the end of the second year. Three years after the treatments had been terminated, 39 of the children in the original group were re-examined and found to have approximately 36 per cent less new caries in the fluoride-treated than in untreated teeth.

Cheyne[20] reported a topical fluoride study in which a 0.05 per cent solution of potassium fluoride was applied to the teeth of 27 children aged 4½ to 6 years. This resulted in a 50 per cent reduction in new caries in deciduous teeth during the first three month period following treatment. His treatment procedure included a dental prophylaxis. The results were based on a comparison of findings in the fluoride-treated group with findings in 19 control children.

During a two month treatment period, Knutson and Armstrong[21-23] made eight to fifteen topical applications of a 2 per cent solution of sodium fluoride to the teeth in two mouth quadrants of each of 289 Minnesota school children, aged 7 to 15 years. A reduction in caries incidence of 40 per cent was reported for the first study year, 41 per cent for the first two year period, and 37 per cent for a three year period of follow-up. All topical applications were made during the first eight week period at the rate of one to two applications a week. The initial application was preceded by dental prophylaxis.

Arnold, Dean and Singleton[24] reported negative results with a single topical application of 0.5 per cent sodium fluoride solution to the teeth of 94 young adults. An equal number of untreated controls were employed.

East and his associates[25] reported giving a series of topical applications of a 0.05 per cent solution of potassium fluoride to one permanent tooth in each of 45 children. The applications were made at approximately four month intervals, but the total number of treatments varied from one to four. The treatment procedure did not include dental prophylaxis. From the comparison of caries experience in the treated teeth with that in forty-five homologous untreated teeth, they concluded that the fluoride applications offered no protection from dental caries. A dental prophylaxis was not given before or during the series of topical applications.

McCauley and Dale[26] treated half the teeth of 21 children aged 2 to 13 years with monthly applications of 0.1 per cent sodium fluoride solution, during a one year period, without prior prophylaxis and without isolating and drying the teeth. These investigators concluded that the method of application reduced the incidence of caries in both treated and control teeth during the treatment year, but that the caries-inhibiting effect was lost during the subsequent year of follow-up.

Jordan and his co-workers[27] applied a 2 per cent solution of sodium fluoride, preceded by dental prophylaxis, to half

20. Cheyne, V. D., Human Dental Caries and Topically Applied Fluorine: A Preliminary Report. *J.A.D.A.* 29:804 (May) 1942.

21. Knutson, J. W., and Armstrong, W. D., The Effect of Topically Applied Sodium Fluoride on Dental Caries Experience. *Pub. Health Rep.* 58:1701 (November 19) 1943.

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27. Jordan, W. A., and others, The Effects of Various Numbers of Topical Applications of Sodium Fluoride. *J.A.D.A.* 33:1385 (November) 1946.

Percentage reduction in the incidence of dental caries in teeth treated topically with fluorides as compared with untreated teeth

Study		Number treated	Teeth treated	Controls	Age	Prophylaxis	Solution	Total number of applications	Years since first application	Per cent reduction
Bibby	(1)	90	One mouth quadrant	Untreated mouth quadrant	10–12	Yes	0.1% NaF	3	1	45.8
	(2)	78	"	"	—	Yes	0.1% NaF	6	2	33.3
	(3)	39	—	—	—	—	—	6	5	36.0
Knutson and Armstrong	(1)	289	One side of mouth	Untreated half of mouth	7–15	Yes	2% NaF	8–15	1	39.8
	(2)	270	—	—	—	—	—	8–15	2	41.4
	(3)	242	—	—	—	—	—	8–15	3	36.7
Jordan and others		241	One side of mouth	Untreated half of mouth	6–12	Yes	2% NaF	1	1	4.9
		575	"	"	6–12	Yes	2% NaF	2	1	10.0
		161	"	"	6–12	Yes	2% NaF	3	1	21.0
		241	One side of mouth (deciduous)	Untreated half of mouth	6–12	Yes	2% NaF	1	1	4.9
		575	"	"	6–12	Yes	2% NaF	2	1	14.5
		161	"	"	6–12	Yes	2% NaF	3	1	40.0
Cheyne		27	All teeth (deciduous)	19	4½–6	Yes	.05% KF	2	0.28	50.0

Arnold, Dean and Singleton	94	All teeth	94	16–23	Yes	0.5% NaF	1	1	0
East and others	48	One tooth per child	Like tooth	Unknown	No	.05% KF	1–4	1	0
McCauley (1) and Dale (2)	21	One side of mouth	Untreated half of mouth	2–13	No	0.1% NaF	3–11	1	Bilateral
	21	—	—	—	—	—	3–11	2	0
Knutson, Armstrong and Feldman	472	One side of mouth	Untreated half of mouth	7–15	No	2% NaF	2	2	9.3
	504	"	"	7–15	No	2% NaF	4	2	20.1
	482	"	"	7–15	No	2% NaF	6	2	21.0
Galagan and Knutson	301	One side of mouth	Untreated half of mouth	7–15	Yes	2% NaF	2	1	21.7
	247	"	"	7–15	Yes	2% NaF	4	1	40.7
	259	"	"	7–15	Yes	2% NaF	6	1	41.0
	272	One side of mouth	Untreated half of mouth	7–15	Yes	.06% PbF_2	2	1	5.9
	214	"	"	7–15	Yes	.06% PbF_2	4	1	1.6
	262	"	"	7–15	Yes	.06% PbF_2	6	1	0.8

the teeth of 977 children aged 6 to 12 years, who were divided into three study groups. They reported that after one, two and three applications, 5, 10 and 21 per cent reduction, respectively, was obtained in new dental caries in permanent teeth. In deciduous teeth, the reductions in dental decay were 5, 15 and 40 per cent, respectively, after one, two and three applications.

Knutson, Armstrong and Feldman[28] applied a 2 per cent sodium fluoride solution two, four and six times, without prior prophylaxis, to the teeth in half the mouth of each of 1,458 children, aged 7 to 15 years, and achieved reductions in dental decay of 10, 20 and 21 per cent, respectively.

Galagan and Knutson[29] applied a 2 per cent solution of sodium fluoride to the teeth of 807 school children, 7 to 15 years of age. After two, four and six topical applications, with prior dental prophylaxis, they obtained reductions of 22, 41 and 41 per cent, respectively. Results were negative from two, four and six applications of a 0.06 per cent lead fluoride solution to the teeth of 748 children.

Evaluation

Chemical studies, concerned with the effect of fluoride solutions on the solubility of enamel in acids, have indicated that several fluoride salts are equally as effective as sodium fluoride, or more effective, in increasing the resistance of enamel to acid decalcification. It is of special interest that one investigator reported lead fluoride to be markedly superior to sodium fluoride,[8] whereas another reported that the two were approximately equal in performance.[9] The results of well controlled clinical tests, however, show that lead fluoride is ineffective as a topical agent for the prevention of dental caries. The lack of correlation between chemical studies and clinical studies suggests that the laboratory methods or technics should be checked carefully and the findings tested clinically before substitutes for sodium fluoride are adopted for general use.

Chemical studies on the solubility of enamel, as affected by fluorides of varying pH, have shown that the lower the pH the more effective is the fluoride solution in reducing enamel solubility.[7,8] One investigator concluded that a pH as low as 2.6 is not injurious to the tooth surface during the time of topical application. It is difficult to concur with this general conclusion at this time, however, in view of the demonstrated fact that decalcification takes place at a pH of 4 or higher. Furthermore, definite etching of enamel is observed in optical and electron microscopic studies of enamel surfaces subjected to acids of a pH range of 4 and higher.[30] Until such time as the clinical use of acidulated aqueous solutions of fluorides has been tested adequately, their use must be considered as entirely experimental.

Undoubtedly, the use of different technics in topical application of fluorides accounts for much of the variation in reported clinical results. The most extensively used technic is as follows:

1. Give a thorough dental prophylaxis.
2. Isolate the teeth with cotton rolls. The teeth in both left or both right quadrants of the mouth are isolated at one time. A cotton roll holder is used in the lower quadrants to retain the cotton rolls in proper position.
3. Dry the teeth with compressed air.

28. Knutson, J. W.; Armstrong, W. D., and Feldman, F. M., The Effect of Topically Applied Sodium Fluoride on Dental Caries Experience. IV. Report of Findings with Two, Four and Six Applications. *Pub. Health Rep.* 62: 425 (March 21) 1947.

29. Galagan, D. J., and Knutson, J. W., The Effect of Topically Applied Fluorides on Dental Caries Experience. V. Report of Findings With Two, Four and Six Applications of Sodium Fluoride and of Lead Fluoride. *Pub. Health Rep.* 62:1477 (October 10) 1947.

30. Scott, D. B., personal communication.

4. Wet the crown surfaces of the teeth with fluoride solution.

5. After the applied solution has dried in air (three to four minutes), dismiss the patient.

Omission of initial cleansing of the teeth reduces the caries-inhibiting effect of the treatment by approximately half.

In two of the clinical investigations which resulted in negative reports[25-26], not only was the clinical experience very limited but initial dental prophylaxis was omitted from the treatment procedure. Further, in one of these studies,[26] the teeth were neither isolated with cotton rolls nor dried before application of the fluoride solution.

The concentration of fluoride solutions used clinically varied from 0.05 per cent in the case of potassium fluoride to 2 per cent in the case of sodium fluoride. A saturated aqueous solution of lead fluoride, 0.06 per cent, was employed in both chemical and clinical tests of this compound. Concentration of aqueous solutions of sodium fluoride has ranged from 0.1 per cent to 2 per cent, with no apparent difference in the caries-inhibiting effect of the solutions. The weaker concentrations have not been tested as fully, however, as the 2 per cent or half-saturated solution.

In clinical studies reported to date, the time spacing of applications given in series can be classed into two broad categories. In the first, all applications were made at the beginning of the study at the rate of one or two a week. In the second, the applications were made throughout the study at the rate of one every three or four months. Whether all applications should be equally spaced over long periods of time or administered during a period of several weeks, is a question which remains to be answered. If, as has been demonstrated, four applications of a 2 per cent sodium fluoride solution are necessary for the maximum of 40 per cent reduction in caries incidence, then wide spacing of applications would delay attainment of full caries-prophylactic effect until the fourth and final treatment. On the other hand, the most practical procedure for utilizing topical fluorides during the period of changing dentition has not been developed.

In this appraisal of the clinical results with topical fluorides, consideration has been given to differences in fluoride solutions and their concentrations; to differences in application procedure and the spacing of treatments, and to the demonstrated difference in results obtained with and without dental prophylaxis. Another critical factor, however, deserves special attention — the number of cases on which each of the reports is based. This factor involves a fundamental question: How many treated and control cases must be observed before differences may be considered statistically significant and not due to chance variation?

From the initial examination records of a group selected for clinical study, it is possible to determine the annual incidence rate of caries, and the number of teeth available for attack by caries. From these determinations can be calculated readily the number of individuals required to insure that differences between treated and control groups are statistically significant. Such calculations indicate that approximately 100 children aged 7 to 15 years, with an annual incidence rate of three fourths to one carious tooth, are required to demonstrate statistically a difference of 40 per cent between treated and untreated teeth, when half the teeth are treated and the other half used as controls.

In the three studies reporting negative results, two were based on numbers of cases which fall far below the calculated 100. Further, both investigations omitted initial dental prophylaxis from

the treatment procedure, which reduced the possible effectiveness by approximately half. In addition, isolation and drying of treated teeth was omitted in one study. On the other hand, the third study reported negative results but used only one application. These latter results can be interpreted as being in general accord with the clinical experience with topical use of fluorides, since a difference of only 5 per cent between treated and control teeth was observed in the positive report involving a much larger number of cases.

Conclusion

A review of the evidence relating to the use of topical fluorides as a caries control measure leads to the following summary conclusions:

1. Of the the several fluoride solutions used, only sodium and lead fluoride have been tested adequately by clinical studies.

2. The results of these clinical tests indicate that a minimum of four applications of a 2 per cent sodium fluoride solution, preceded by a dental prophylaxis, is required to obtain a maximum of 40 per cent reduction in the incidence of dental caries.

3. The use of as many as six applications of lead fluoride is not associated with a caries prophylactic effect.

ACTIONS AND USES OF ASTRINGENTS, STYPTICS AND CAUSTICS

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ASTRINGENTS, styptics and caustics may be considered as a group since many substances induce all three types of reaction, the difference often depending upon the concentration in which they are used.

When astringents come in contact with a mucous surface, a thin film is formed upon the surface and the superficial membranes and blood vessels are contracted, causing shrinkage of the tissue. The surface film is the result of protein precipitation. This kind of chemical action coagulates blood with which the drug comes in contact.

It was once thought that the inflammation and edema symptomatic of gingivitis and periodontitis would be eliminated by the therapeutic action of such drugs. Astringents have been advocated also for the treatment of gingival ulcerations, for elimination of gingival pockets and as antibacterial agents.

Astringent action is superficial and transient. It contributes nothing toward the removal of etiologic factors such as calculus, traumatic occlusion and other local or systemic causative factors. Unless the causes are removed, application of astringent solutions cannot reduce inflammatory reaction, which is primarily a protective mechanism. If the causes of inflammation are removed, medication is usually unnecessary. Tannic acid and its derivatives, dilute acids and the salts of the heavy metals are astringent.

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Tannic acid is used as a styptic. It has been incorporated in surgical cement to produce a dense coagulum as a protective covering for wound surfaces after gingival surgery. Covering such wounds with a zinc oxide-eugenol cement protects the tissues from trauma and bacterial invasion until the surface is covered with a new growth of epithelium, and evidence is lacking that the addition of tannic acid will decrease the time required for healing or, indeed, that the time will not be increased.

Zinc chloride in 8 per cent solution will cauterize granulation tissue, which may grow after gingivectomy or pocket treatment before epithelization is complete. Thus the bulk of the reformed tissues may be partially controlled.

Zinc chloride has also been advocated to eliminate periodontal pockets and to increase gingival circulation, the latter by saturating cotton with the solution and packing the interdental spaces. No evidence has been presented to justify such uses. Aqueous solutions of zinc chloride are acid and may attack tooth enamel.

Copper sulfate is caustic and astringent. In paste form it is frequently sealed in periodontal pockets for the purpose of eliminating them. Periodontal and gingival pockets are lined with epithelium which prevents union of the soft tissue and the cementum. Conservative pocket elimination is accomplished by removal of irritant, functional and other causative factors, followed by destruction of the epithelial lining, formation of a blood clot and close coaptation of the soft tissue and the root. Copper sulfate is not an epithelial solvent, and the introduction of a paste into the pocket increases the space between the hard and soft structures. Thus, the use of copper sulfate for this purpose is irrational. Should as much as 0.25 Gm. of the medicament be swallowed, emesis will follow.

The iron compounds used as styptics include ferric subsulfate solution and ferric chloride tincture. Both are sufficiently acid in reaction to injure enamel if they are allowed to come in contact with it.

Small hemorrhages from the oral mucosa or tooth sockets do not require the use of styptics. Removal of the poorly organized blood clots, débridement and pressure on the bleeding point are usually sufficient for control of hemorrhage. Epinephrine solution on cotton or gauze under pressure may be helpful. Severe hemorrhage or bleeding at points inaccessible to pressure requires hemostatics or the tying of blood vessels for control.

The older styptics are being replaced by such preparations as topical thrombin, fibrin foam and absorbable gelatin sponge.

Caustics are employed to desensitize dentin, to aid in treatment of periodontal pockets, in chemosurgery and, usually inadvisably, as antibacterial agents.

Hydrochloric, nitric and sulfuric acids aid in enlarging root canals. When these agents are used there is danger of injuring or destroying normal periapical tissue. Therefore their use should be limited to those cases in which it is impossible to enlarge the canals mechanically or in which periapical curettage or apicoectomy is contemplated.

The discomfort of hypersensitive dentin can be relieved by local application of ammoniacal silver nitrate, formaldehyde solution U.S.P., paraformaldehyde, strong solutions of zinc chloride, liquefied phenol or a mixture consisting of one part of sodium carbonate monohydrate and five parts of potassium carbonate with enough glycerin to make a heavy paste.[1] A paste consisting of equal parts of sodium fluoride, kaolin and glycerin has also been used for this purpose. Its properties and limitations are not adequately understood, and the possibility that it may harm the dental pulp is sufficiently great to warrant the suggestion that it not be generally used.

1. Grossman, L. I., The Treatment of Hypersensitive Dentin. *J.A.D.A.* 21:2050 (Nov.) 1934.

Ammoniacal silver nitrate, reduced by eugenol or a 10 per cent aqueous solution of formaldehyde, is the most satisfactory agent for treatment of hypersensitive dentin. Its extensive use for disinfection of deep cavities without damage to the dental pulp, provided the pulp is not exposed, is ample proof of its safety. The resultant black stain limits its use to the posterior teeth except in instances where the stain can be covered by a restoration or otherwise obscured from view. For the anterior teeth, formaldehyde, paraformaldehyde, liquefied phenol or a highly concentrated solution of zinc chloride may be selected. Care must be exercised in the application of these substances to prevent possible deleterious action on the dental pulp or gingivae.

Phenol is a useful aid in treatment of pockets. A cotton twill moistened with this drug and packed into the pocket for a short time will cauterize the epithelial lining and granulation tissue within the pocket sufficiently to insure greater ease and efficiency of curettage. The anesthetic effect of the medicament reduces the discomfort of the operation. Liquefied phenol or a 50 per cent or 25 per cent solution in alcohol may be employed. Trichloracetic acid 50 per cent aqueous solution has also been used for this purpose.

When methods designed to conserve gingival tissue fail, surgical elimination of pockets may be indicated. Extensive hyperplasia, operculums, neoplasms, tortuous periodontal pockets, periodontal involvement of bifurcations or gingival tissue that interferes with restorative procedures usually require surgical intervention. To eliminate the necessity for anesthesia and to avoid hemorrhage, chemosurgery may be substituted for excision. Tissue may be removed by topical application of such caustics as sodium or potassium hydroxide,[2] paraformaldehyde,[3] trichloracetic acid, phenol or silver nitrate. The principal disadvantage of chemosurgery is lack of control. It is impossible to determine accurately the amount of tissue that will be destroyed, and extensive damage may occur unless extreme care is taken.

Caustics and astringents are sometimes employed as antibacterial agents in the treatment of acute gingival conditions such as necrotizing ulceromembranous gingivitis (Vincent's infection). Chromic acid has been used extensively for this purpose Its action is purely destructive, the bacteria being destroyed with the tissue containing them.[4] One of the aims of good treatment is the preservation of the normal contour of the gingivae. Destruction of these tissues by chromic acid or other caustics produces spaces that are difficult to keep clean, thus predisposing to recurrence of infection. Its solvent effect on enamel and cementum is a further contraindication to the use of chromic acid.

Oxidizing agents have been employed in the treatment of necrotizing ulceromembranous stomatitis with the object of creating an environment high in oxygen which would be unfavorable to anaerobic bacteria. However, peroxides are produced by these micro-organisms in the normal course of metabolism, together with catalase to destroy them.[5] The motility and growth of the bacteria are unaffected by oxygen-liberating compounds,[4] though the ebullient action of such compounds may make them useful as mechanical cleansers, to remove debris. Hydrogen peroxide and sodium perborate are examples of this group. Improper or prolonged use may result in burns of the mucosa or in pseudo-black tongue.

Phenol, creosote and silver nitrate are applied in attempts to disinfect dentin. Evidence of their effectiveness and the

2. Gratzinger, Max, Elimination of Periodontal Pockets by Chemical Cautery. *D. Digest* 51:120 (March) 1945.

3. Orban, Balint, Gingivectomy by Chemosurgery. *J.A.D.A.* 30:198 (Feb. 1) 1943.

4. Rosenthal, S. L., The Effect of Medicaments on the Motility of the Oral Flora With Special Reference to the Treatment of Vincent's Infection. *J. Periodont.* 8:71 (July) 1937.

5. McCulloch, E. C., *Sterilization and Disinfection.* Philadelphia: Lea & Febiger, 1936.

superiority of creosote has been presented.[6]

Caustic substances are less efficient bactericides than are the non-caustic. A precipitate of organic matter often forms a protective coagulum around the bacterial cell, preventing contact of the drug with the micro-organism and permitting its survival. Thus 10 per cent silver nitrate may be less effective than a 1 per cent solution.[4] For the same reason, alcoholic solutions are less effective than aqueous.[7] Furthermore, caustic solutions may disintegrate sufficient tissue to serve as a pabulum for additional bacterial growth and also remove tissue which could be advantageously conserved.

6. Seltzer, Samuel, The Comparative Value of Various Medicaments in Cavity Sterilization. *J.A.D.A.* 28: 1844 (Nov.) 1941.

7. Appleton, J. L. T., *Bacterial Infection*, ed. 3. Philadelphia: Lea & Febiger, 1944.

EFFECTS OF PANTOTHENIC ACID DEFICIENCY ON THE MANDIBULAR JOINTS AND PERIODONTAL STRUCTURES OF MICE

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REALIZATION of the importance of pantothenic acid in the nutrition of several animals, including the mouse,[1-4] followed its synthesis by Stiller, Keresztesy and Finkelstein as reported by Williams and Major[5] in 1940. The first effect of a pantothenic acid deficiency in weanling mice was failure to grow, manifested about one week after institution of the deficient regimen. The young mice gradually lost weight and none survived much beyond six weeks.[2] Levy and Silberberg[6] found that pantothenic acid deficiency inhibited endochondral ossification of the long bones of mice.

Wainwright and Nelson[7] reported changes in the oral epithelium of young rats maintained on a diet deficient in pantothenic acid. Hyperkeratosis and necrosis, with proliferation of the basal layer of cells, were described. There was no inflammatory response to these lesions, but in some animals resorption of the alveolar crest was noted.

The condyle represents the most important growth center of the mandible; yet the influence of nutrition on its

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2. Morris, H. P., and Lippincott, S. W., The Effect of Pantothenic Acid on Growth and Maintenance of Life in Mice of C3H Strain. *J. Nat. Cancer Inst.* 2:29 (Aug.) 1941.

3. Unna, K., Pantothenic Acid Requirement of the Rat. *J. Nutrition* 20:565 (Dec.) 1940.

4. Daft, F. S.; Sebrell, W. H., Babcock, S. H., Jr., and Jukes, T. H., Effect of Synthetic Pantothenic Acid on Adrenal Hemorrhage, Atrophy, and Necrosis in Rats. *Pub. Health Rep.* 55:1333 (July 26) 1940.

5. Williams, R. J., and Major, R. T., The Structure of Pantothenic Acid. *Science* 91:246 (March 8) 1940.

6. Levy, B. M., and Silberberg, M., Inhibition of Endochondral Ossification in Pantothenic Acid Deficiency. *Proc. Soc. Exper. Biol. & Med.* 63:380 (Nov.) 1946.

7. Wainwright, W. W., and Nelson, Marjorie M., Changes in the Oral Mucosa Accompanying Acute Pantothenic Acid Deficiency in Young Rats. *Am. J. Orthodont. & Oral Surg.* 31: Sec. Oral Surg. 406 (July) 1945.

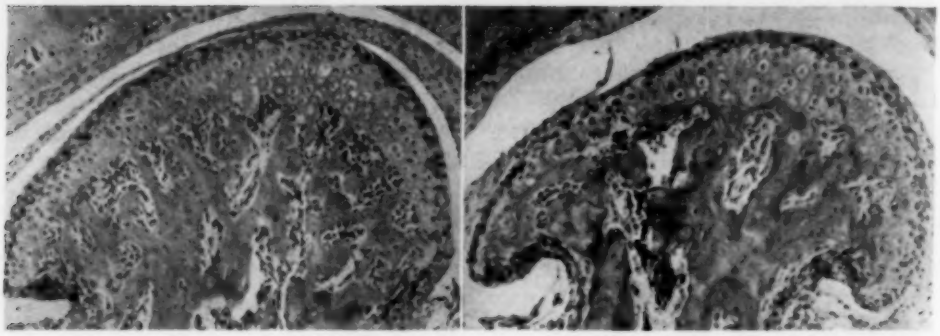

Fig. 1.—Left: Temporomandibular joint of 5 week old mouse after one week of the synthetic control diet. Right: Joint of a mouse of the same age after one week of the deficient diet. A decrease in the number of cells in the intermediate zone is apparent

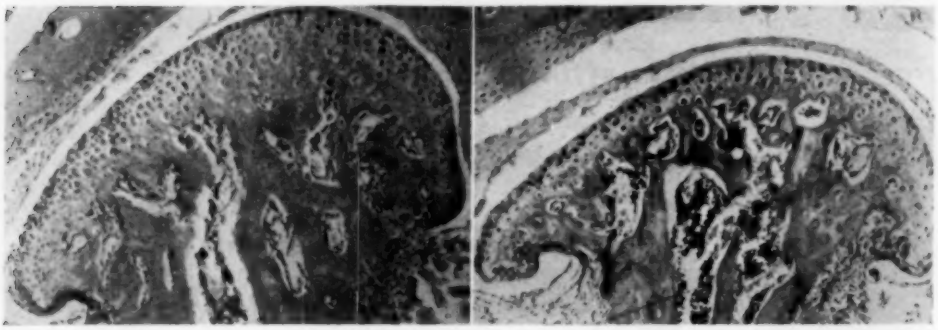

Fig. 2.—Left: Joint of 6 week old mouse after two weeks of the synthetic control diet. Right: Result in a mouse of the same age after two weeks of the deficient diet. The width of the cartilage cap is reduced and the chondrocytes are decreased in size

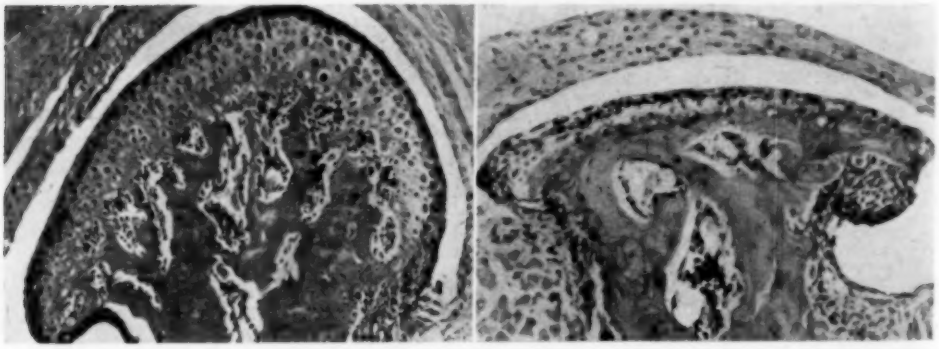

Fig. 3.—Left: Joint of 8 week old mouse after four weeks of the synthetic control diet. Right: Result in a mouse of the same age after four weeks of the deficient diet

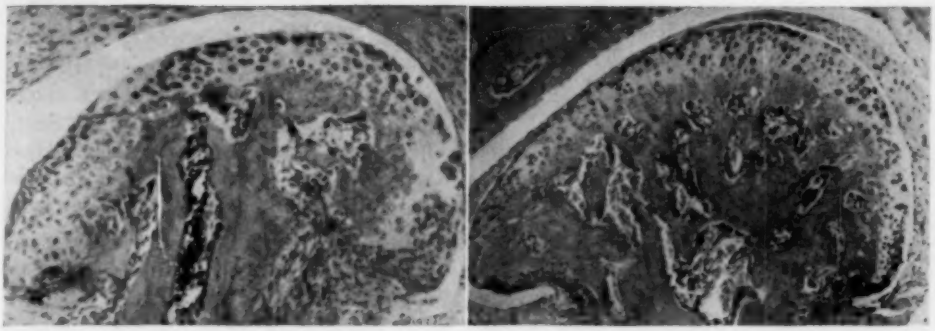

Fig. 4.—Left: Joint of 9 week old mouse after four weeks of the deficient diet followed by refeeding of the stock ration for five days. There is a preponderance of intermediate cells. Right: Joint of 10 week old mouse after four weeks of the deficient diet followed by refeeding of the stock ration for two weeks

growth and development has not been thoroughly studied. Weinmann,[8] working with white rats, found that rachitogenic diets produced changes in the mandibular condyle analogous to those observed in the articular and epiphyseal cartilage of the long bones; that is, increased thickness of condylar cartilage and clubbing of the condyle itself.

The present study was undertaken to determine the effect of a diet deficient in pantothenic acid on the growth and development of the mandibles of mice.

Twenty male C57 black mice, 25 to 28 days of age, were used in this experiment. The mice were fed, ad libitum, a synthetic diet deficient in pantothenic acid for one, two and four weeks and then were killed. Nine male animals of the same age were given the deficient diet for four weeks, after which they were fed Purina Laboratory Chow for varying periods. As controls, additional mice of the same strain were fed the complete synthetic diet, and others were given the Purina Laboratory Chow. Water was available to the animals at all times.

The experimental ration consisted of:[9]

Sucrose	68 Gm.
Vitamin test casein	18 Gm.
Vegetable oil	10 Gm.
U.S.P. salt mix #12	4 Gm.
Cod liver oil	1 Gm.
Riboflavin	0.5 mg. per 100 Gm.
Thiamin	0.2 mg. per 100 Gm.
Nicotinic acid	1.0 mg. per 100 Gm.
Pyridoxine	0.2 mg. per 100 Gm.
Choline chloride	1.0 mg. per 100 Gm.
Inositol	100 mg. per 100 Gm.

Ten milligrams of calcium pantothenate was added per 100 Gm. of ration

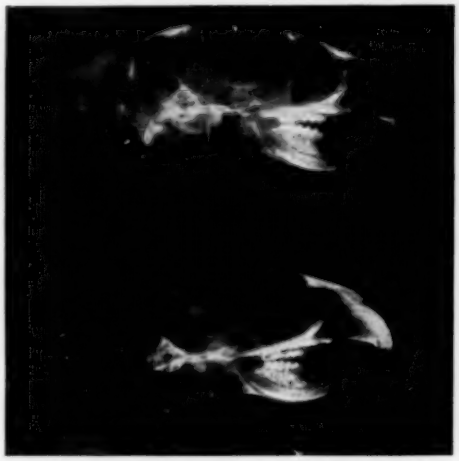

Fig. 5.—Roentgenogram of the heads of 2 mice 6 weeks old. Upper head: Result of two weeks of the synthetic control diet. Lower head: Result of two weeks of the deficient diet

8. Weinmann, J. P., Rachitic Changes of the Mandibular Condyle of the Rat. *J. D. Res.* 25:509 (Dec.) 1946.

9. Vitamins used in this study were supplied by Merck and Company, Inc., through the courtesy of Dr. D. F. Robertson.

for the synthetic control diet.

At the end of each time period, both experimental and control mice were killed and roentgenograms were made of the heads of all. The heads were fixed in 10 per cent neutral solution of formaldehyde and the mandibular joint was removed as described in a previous study.[10] The jaws were decalcified and embedded according to the technic of Morse,[11] serial sagittal sections were prepared and photomicrographs were made.

Gross Observations

All animals maintained on the deficient diet either failed to gain or lost weight. Characteristic changes in the hair occurred about the third to fourth week. Loss of hair, especially on the ventral surface and the face, occurred first, followed by graying of the hair after the fourth week.

Microscopic Observations

Temporomandibular Joint.—After one week on the deficient diet, the growth cartilage of the condyle was reduced in width. The cells of the hypertrophic zone were quite distinct; the cells of the intermediate zone were not as numerous as in normal animals of the same age. There were few trabeculae, and these were covered by a discontinuous layer of small, flat spindle cells instead of the usual osteoblastic layer. The chondrocytes were smaller than normal. There was a thin layer of calcified bone extending across the base of the hypertrophic layer in some areas and into this layer in others (Fig. 1).

In animals fed the deficient diet for two weeks, the growth cartilage of the condyle was narrower than usual. The chondrocytes were smaller than in normal control animals, and there was an increase in intercellular substance. The hypertrophic cells were less numerous than in animals fed the deficient diet for one week, and there was further calcification and ossification of the cartilage. There were transverse bony links at this stage similar to those seen in the metaphysis of long bones in these animals[6] (Fig. 2).

After four weeks on the deficient diet, the cartilage covering the condyle was only two or three cells wide. The undifferentiated cells were still present, but they were smaller than normal. There were no cells of the intermediate layer and only one or two cells per row in the hypertrophic zone. Calcification of this layer had progressed, and there was complete transverse bony linking beneath the cartilage. The chondrocytes that remained were much smaller than normal (Fig. 3).

The changes were not permanent. When a mouse given the deficient diet for four weeks was fed the stock ration again, chondrogenesis was renewed. After five days the intermediate zone was fairly wide, whereas the zone of hypertrophic cells was still calcified and about the same width as the corresponding zone in the deficient animal. The new cells of the intermediate zone were larger than those of the normal animal. In many areas two cells could be seen within the same capsule (Fig. 4, left).

After two weeks of refeeding the stock ration, the width of the cartilage cap was normal or even wider than normal. The intermediate zone was still the more prominent one, but the hypertrophic zone was now distinct (Fig. 4, right).

Roentgen examination illustrates the retardation of mandibular growth associated with pantothenic acid deficiency (Fig. 5). The mandible, measured from the tip of the condyle to the base of the angular process, was 18 to 20 per cent smaller than in the normal control animals. When measured from the tip of the condyle to the tip of the incisor tooth,

10. Levy, B. M., Growth of Mandibular Joint in Normal Mice. *J.A.D.A.* 36:177 (Feb.) 1948.

11. Morse, Anna, Formic Acid-Sodium Citrate Decalcification and Butyl Alcohol Dehydration of Teeth and Bones for Sectioning in Paraffin. *J. D. Res.* 24: 143 (June-Aug.) 1945.

or to the alveolar crest on the lingual surface of the incisor tooth, the mandible was 8 to 10 per cent smaller than normal.

Refeeding the stock ration induces a prompt growth response resulting in a mandible of normal size.

Periodontal Structures.—After one week of the deficient diet there was generalized hyperemia of the pulp. In some animals there was extravasation of red blood cells into the surrounding pulp tissue. The cells of the pulp, however, were still intact, and the dentin showed no change. The periodontal tissues appeared normal (Fig. 6).

In animals fed the deficient diet for two weeks the changes were most evident in the alveolar bone. The alveolar crest was below its normal level, and the periodontal membrane was wider than normal (Fig. 7, A and B). The osteoblastic layer, which normally lines the alveolar septum at the crest and between the teeth, was composed of small, spindle-shaped cells instead of the usual cuboidal cells (Fig. 7, C-H). There was proliferation of the epithelial rests in all animals fed the deficient diet for two weeks or longer. The periodontal membrane of the interradicular bone was wider than usual (Fig. 8). In some of the animals there were larger blood vessels in closer proximity to the alveolar bone than in the normal control group.

After four weeks of the deficient diet, the alveolar crest was further resorbed and the alveolar septum much narrower than normal. At this stage there was a downward proliferation of epithelium along the roots of the teeth (Fig. 9, left). This downward growth was not accompanied by inflammatory changes. There was no necrosis of the gingival epithelium. The interradicular bone showed further resorptive changes, and in some animals osteoid tissue appeared (Fig. 9, right).

Refeeding the stock ration after four weeks of a deficient diet induces prompt reparative activity. The osteoblastic layer of cells returns, many of the cells being larger than normal (Fig. 10).

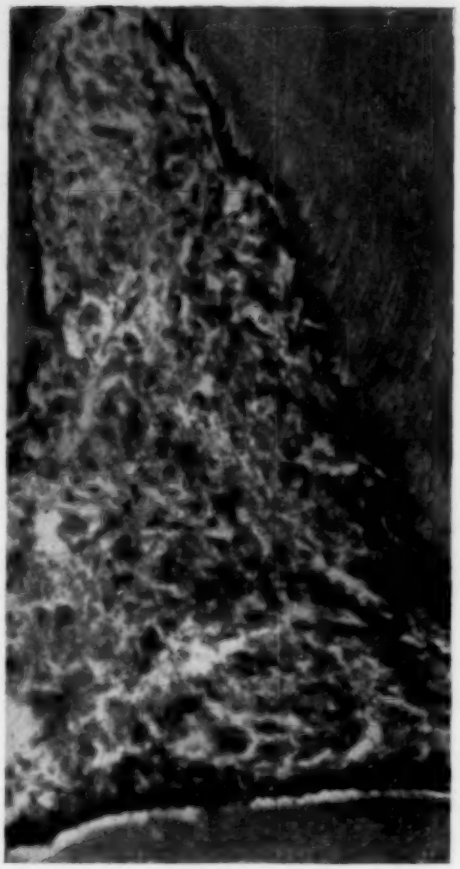

Fig. 6.—Section of lower first molar of a mouse, aged 5 weeks, after one week of the deficient diet. Note the marked hyperemia and extravasation of red blood cells into the pulp tissues

Comment

Pantothenic acid deficiency affects the general metabolism of the mouse. Morris[12] states that the many symptoms observed during the deficient state may be explained by the inability of any given tissue to retain its integrity under the

12. Morris, H. P., Review of the Nutritive Requirements of Normal Mice for Growth, Maintenance, Reproduction and Lactation. *J. Nat. Cancer Inst.* 5:115 (Oct.) 1944.

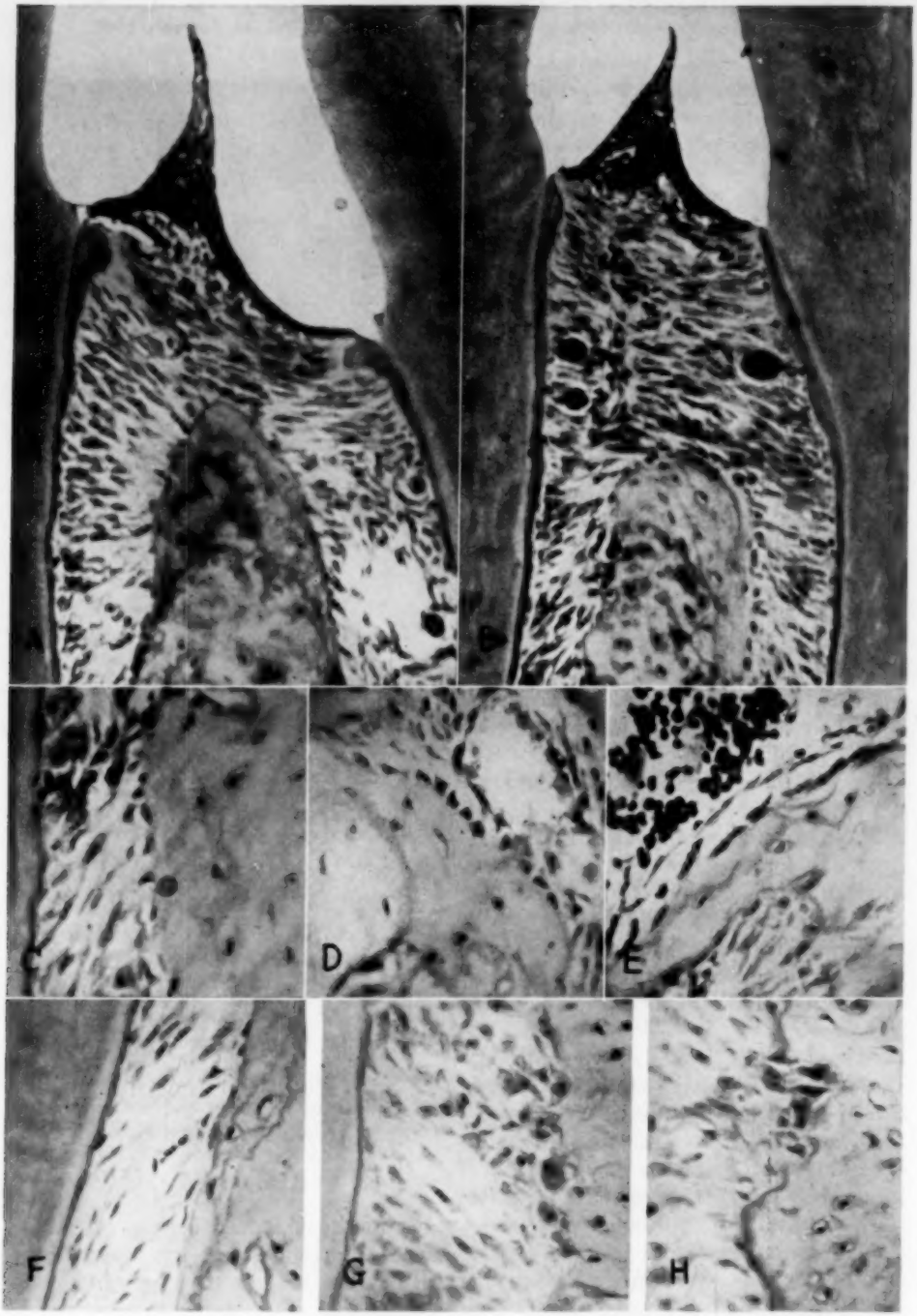

Fig. 7.—A: Alveolar bone of 6 week old mouse after two weeks of synthetic control diet. B: Result after two weeks of the deficient diet in a mouse of the same age. Note reduced height and width of the alveolar bone and proliferation of epithelial rests. C, D and E: High power photomicrographs of alveolar bone of 6 week old mice taken after two weeks' feeding of synthetic control diet. Osteoblasts are normal. F, G and H: High power photomicrographs taken after two weeks' feeding of the deficient diet to mice of the same age. Note small, spindle-shaped cells replacing normal osteoblasts in F and giant-cell osteoclasts in G and H

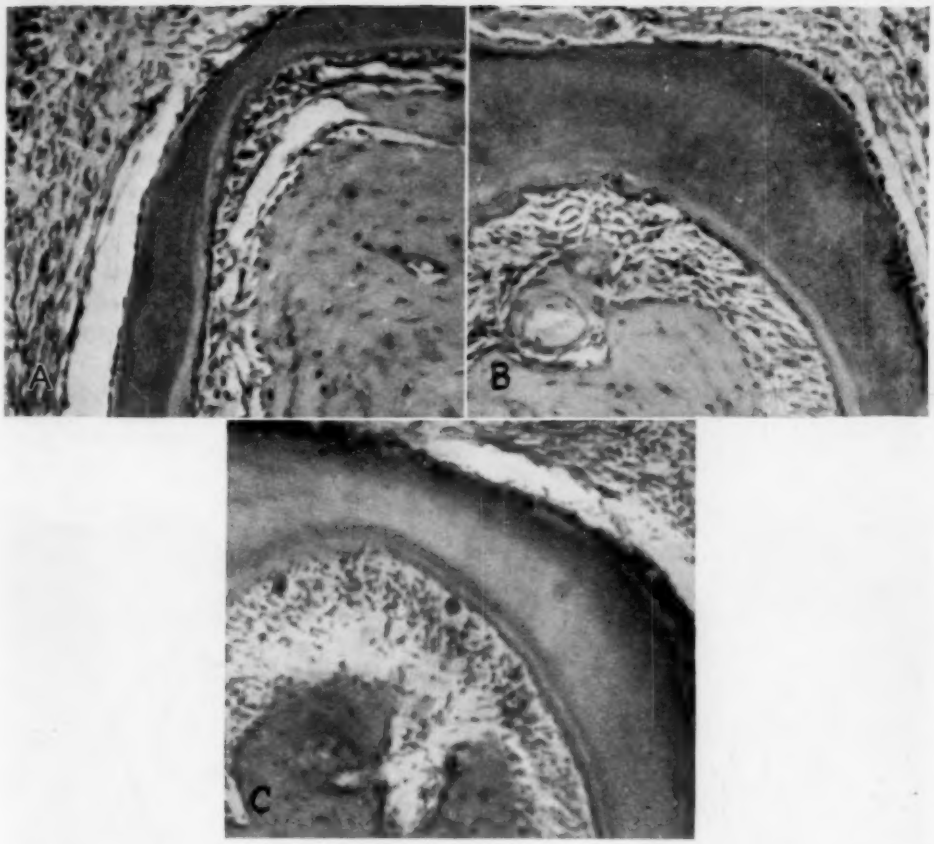

Fig. 8.—A: Alveolar bone of a mouse, aged 6 weeks, after two weeks of the synthetic control diet. B: Result in a mouse of the same age after two weeks of the deficient diet. Loss of interradicular bone is apparent. C: Result after four weeks of the deficient diet in a mouse aged 8 weeks. The interradicular bone shows further resorption, with formation of osteoid tissue

stress of inadequate supplies of pantothenic acid. Because of its wide distribution in nature, this vitamin must be of great importance to cellular metabolism.

Wolbach and Bessey[13] point out that narrowing of the epiphyseal cartilage and lack of osseous growth are common reactions to several types of malnutrition. The skeletal changes observed in this series of mice differ from those seen in animals maintained on a quantitatively reduced but qualitatively adequate diet. In underfed animals, growth proceeds at a decreased rate, ossification may be increased in spite of the decreased growth rate, and the bone marrow undergoes serous atrophy.[14] In pantothenic acid deficiency, proliferation and development of the cartilage are suspended and ossification ceases. No changes occur in the bone marrow.

Inhibition of proliferation and of hypertrophic growth of the mandibular con-

13. Wolbach, S. B., and Bessey, O. A., Tissue Changes in Vitamin Deficiencies. *Physiol. Rev.* 22:233 (July) 1942.

14. Silberberg, M., and Silberberg, R., Changes in Cartilage and Bone of Immature Female Guinea Pigs Due to Undernourishment, With Consideration of Processes of Repair Following a Period of Refeeding. *Arch. Pathol.* 30:675 (Sept.) 1940.

dyle results in a mandible of less than normal size. Maxillary growth is not retarded as much as mandibular growth, so that a malrelation of the jaws is produced. Weinmann and Sicher[15] stated that there is a certain independence of growth of the two parts of the facial skeleton. The chief factor of growth in the maxilla is proliferation of connective tissue, or sutural growth. In the mandible the chief factor is proliferation of cartilage. This may explain the difference in the reaction of the maxilla and the mandible to various nutritional stimuli.

15. Weinmann, J. P., and Sicher, H., *Bone and Bones*. St. Louis: C. V. Mosby Company, 1947.

Downward proliferation of epithelium along the roots of the teeth of mice, as well as enlargement of the epithelial rests, may constitute a primary response of the epithelium; but there may also be a change in the connective tissue secondarily affecting the epithelium and stimulating it to grow. Lippincott and Morris[16] have described a hyperkeratotic, desquamative dermatosis occurring in mice deficient in pantothenic acid, which may lend some support to the theory that the changes are primarily epithelial.

16. Lippincott, S. W., and Morris, H. P., Morphologic Changes Associated With Pantothenic Acid Deficiency in the Mouse. *J. Nat. Cancer Inst.* 2:39 (Aug.) 1941.

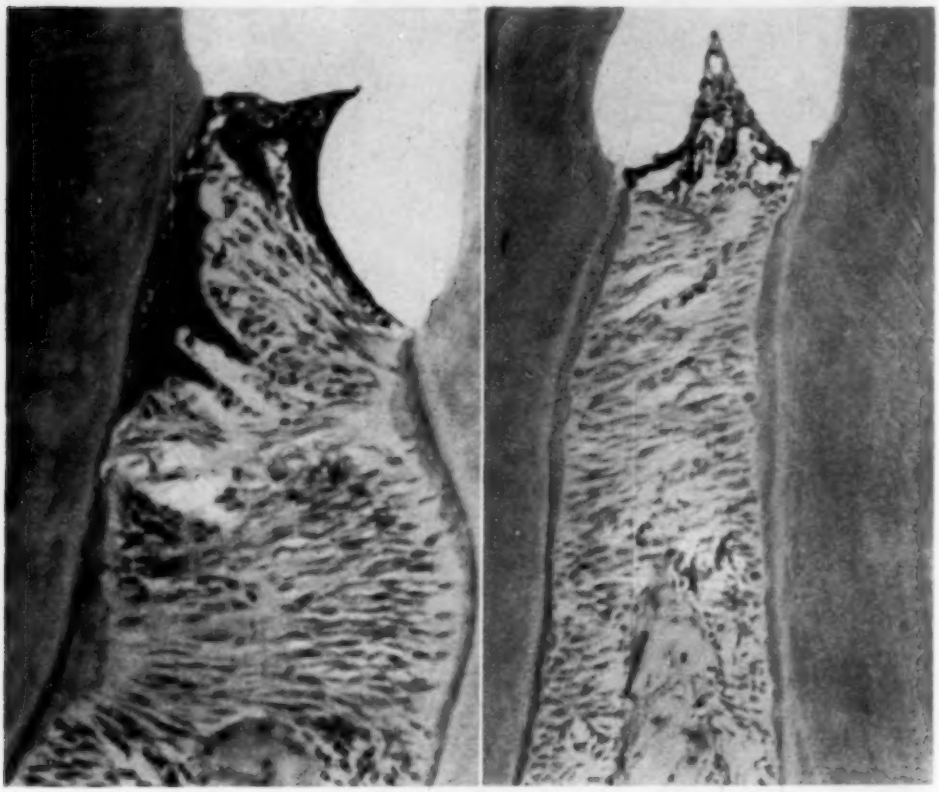

Fig. 9.—Left: Alveolar bone of a mouse, aged 8 weeks, after four weeks of the deficient diet. There is a reduction in height of the alveolar crest and downward proliferation of the oral epithelium. Right: Result after four weeks of the deficient diet, followed by refeeding of the stock ration for one week, in a mouse aged 9 weeks. The osteoblasts at the alveolar crest have increased in both number and size

Changes in the alveolar bone of mice lend further support to the assumption that connective tissue is affected by a deficiency of pantothenic acid. There is a disturbance in the normal equilibrium between resorption and deposition of bone. The presence of osteoid tissue covered by scanty or poorly developed osteoblasts suggests a disturbance in bone formation. On the other hand, resorption of bone continues, as is indicated by a decreasing height of the alveolar crest and the occurrence of many osteoclasts.

In animals deficient in pantothenic acid there is a proliferation of squamous epithelium. This is in contrast to the epithelial changes associated with vitamin A deficiency, which are limited to the specialized epithelial surfaces and consist of replacement metaplasia, so that secretory, or ductal, epithelium is replaced by squamous epithelium.

The hemorrhagic adrenal cortical necrosis observed in rats given diets deficient in pantothenic acid was not observed in this study.[3, 4, 17, 18] Lippincott and Morris[16] have suggested that the shorter survival period of the mouse on a diet deficient in pantothenic acid may account for the absence of adrenal injury in this species. We did note hemorrhagic lesions in the pulps of the teeth in these mice, and perhaps the same mechanism

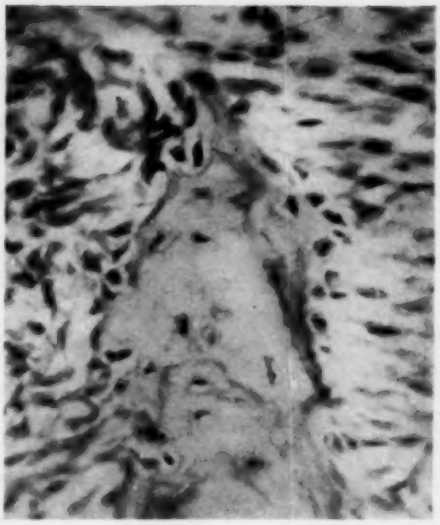

Fig. 10.—High power photomicrograph of Figure 9, right

that causes adrenal hemorrhages in rats is responsible for pulpal hemorrhages in mice.

Summary

In mice deficient in pantothenic acid, proliferation is inhibited and there is hypertrophy of the growing cartilage of the condyle. These changes are similar to those observed in the knee joints. Lack of bone formation, continuing resorption of the alveolar bone, a narrow interdental septum, a broad periodontal membrane and a low alveolar crest were noted. There is epithelial proliferation along the roots of the teeth, with an increase in size of the epithelial rests.

17. Salmon, W. P., and Engel, R. W., Pantothenic Acid and Hemorrhagic Adrenal Necrosis in Rats. *Proc. Soc. Exper. Biol. & Med.* 45:621 (Nov.) 1940.

18. Mills, R. C., and others. Curative Effect of Pantothenic Acid on Adrenal Necrosis. *Proc. Soc. Exper. Biol. & Med.* 45:482 (Oct.) 1940.

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Effects of Various Acids on Tooth Structure.—Most acids and acid salts, except boric acid, dissolve calcareous material such as bones and teeth. Sulfuric acid and other acids which form insoluble salts with calcium tend to be self-limiting in their actions on tooth structure. Partly for this reason, sulfuric acid is sometimes preferred to others for enlarging root canals. Chromic acid will dissolve tooth structure and will fix the superficial soft tissues. It is toxic if swallowed.—*Accepted Dental Remedies, edition 14, page 9.*

STUDIES IN PUBLIC HEALTH DENTISTRY: DENTAL TREATMENT NEEDS OF 3,282 CHILDREN AGED 2 TO 16 YEARS, IN NEW YORK CITY

Henry C. Sandler,* D.M.D., M.P.H., and Harry Strusser,† D.D.S., M.S.P.H., New York

THE last two decades have seen a considerable increase in the amount of free dental treatment for indigent children in the United States, but little has been reported on the dental treatment experience of such children. Many surveys of dental needs of the child population have been made, but they do not take into consideration the special factors which influence the treatment requirements of children drawn from the indigent population. Drying of the teeth and the use of bitewing roentgenograms frequently will enable an examiner to discover more caries than can be detected in preliminary examinations. The prediction of dental treatment needs from survey data is apt to underestimate the dental treatment requirements and must be of lesser reliability than actual treatment experience.

Several aspects of dental treatment experience for children have been reported by Altman[1, 2, 3] who studied the needs of children treated in urban part-pay clinics, and by Wisan and his associates[4] who reported on the costs of treatment of children in private offices and in clinics. Specific information in terms of the needs of children treated in free dental clinics is lacking. This study was designed, therefore, to measure the actual treatment provided for children in the dental clinics of the Department of Health of New York City, to estimate the amount of dentist time required and to measure the variation which may be expected.

Dental Health Education

The departments of health and education of New York City cooperate in an intensive program of dental health education for all children. Dental hygienists, teachers and school health counselors all do their share in teaching positive attitudes toward dental health, fostering the development of good dental habits and persuading the children and parents of the importance of immediate correction of dental defects. All children are referred to their family dentist at least once a year, and where possible, twice a year. In spite of these efforts, a large percentage of parents do not seek dental care for their children,[5] and only about half of the children referred to their family dentists actually visit them.

*Assistant Director, Bureau of Dentistry, New York City Department of Health.
†Director, Bureau of Dentistry, New York City Department of Health.

1. Altman, Isidore, Dental Services Received by Children in a New York Clinic. *Pub. Health Rep.* 62:1355 (September 19) 1947.
2. Altman, Isidore, Time Per Service in a Children's Dental Clinic. *Pub. Health Rep.* 61:1211 (August 16) 1946.
3. Altman, Isidore, Services and Visits in a Children's Dental Clinic. *Pub. Health Rep.* 62:113 (January 24) 1947.
4. Wisan, J. M.; Galagan, D. J., and Chilton, N. W., Studies in Dental Public Health Administration: I. Cost Analysis of the New Jersey Dental Treatment Program, 1944-1945. *J.A.D.A.* 34:322 (March 1) 1947.
5. Nyswander, Dorothy B., *Solving School Health Problems; the Astoria Demonstration Study, Sponsored by the Department of Health and the Board of Education of New York City.* New York: Commonwealth Fund, 1942, p. 215.

Economic status is doubtlessly an important factor limiting the dental care of an individual child, but even among people of the lowest economic levels there is a percentage who will seek and pay for private dental treatment. For example, of a group of children who lived in one of the worst slum areas of New York City (Harlem) it was possible to stimulate 23 per cent to seek private dental care.[6]

The desirability of encouraging self-reliance led to greater emphasis on dental health education and treatment by private dentists as a means of obtaining correction of dental defects. In the school year 1946-1947, 530,000 children were referred to their family dentists, and 302,000 (57 per cent) visited them.

Eligibility for Free Treatment

Although education can influence many parents to seek private dental care for their children, a substantial number cannot afford to pay for private treatment, and educational methods alone cannot protect the dental health of their children. Based on the principle that when a health problem is so great that it cannot be solved by the family it becomes the responsibility of the community, the Department of Health of New York City operates free dental clinics for children whose parents cannot afford to pay for private care. The maximum income determining eligibility for free treatment is $31.73 a week for a family of three (one child) plus $4.81 for each additional dependent.

Sixteen of the clinics are located in district health center buildings, and 120 are located in school buildings. The health center units have three dentists each, and the school clinics have one dentist each. The children of this sample were treated in these clinics.

Once a patient has been registered at a clinic it is the policy of the Bureau of Dentistry to complete all dental treatment needed. In health center clinics, bitewing roentgenograms are made routinely before treatment and frequently after completion of treatment. The senior dentist checks the work on the last visit to assure thorough and complete treatment. In the school clinics roentgenograms are not made routinely, but patients may be sent to the local health centers to have them made. Ten dental supervisors frequently visit all clinics and check on the quality and completeness of dental treatment. It can be said with assurance that the patients are in good dental condition at time of completion.

"Completed," as used in this study, means that a prophylaxis was given; all savable carious teeth, deciduous or permanent, were filled with silver amalgam over a cement cavity lining; all unsavable teeth were extracted; all carious pit and fissure defects were filled with silver amalgam, and all fillings were polished. The prophylaxis is done by a dental hygienist, and rarely by the dentist. A completed tooth is one that has had all defective areas filled, regardless of the number of fillings necessary.

In 1946 there were 32,030 children treated in all of the Department of Health dental clinics, of whom 19,534 (61 per cent) received complete treatment. In spite of all efforts, a substantial number of children did not have treatment completed for reasons of absence, transfer, emergency, illness, emotional instability and so forth, and some children were still under treatment at the end of the year. Among those under treatment were many who had a major portion of the work finished.

Selection of the Sample

The sample of 3,282 children is made up of all the children in the reporting clinics who completed dental treatment for the *first time* in any Department of

6. Strusser, Harry, and Sandler, H. C., A Program of Dental Health Education Supplementing the Activity of the School Dental Clinics. *D. Outlook* 30:218 (May) 1943.

Health clinic between January and July, 1946, and represents about 25 per cent of the children who had work completed in all dental clinics of the Department of Health during this period.

The data were collected during July, when half of the staff was on vacation and only half of the school clinics were open. The school clinics which reported, however, are representative of all health districts and clinics of the city. The sixteen health center clinics are open the year around so that the data from all of them are included.

The selection of children of low economic status as clinic patients tends to introduce a large proportion with a backlog of accumulated dental neglect. The policy of the Bureau of Dentistry is to treat first the patients most in need of care, which raises the average of treatment needs. These factors weight the sample in the direction of greater dental needs than would be expected in a random sample of children. This sample, therefore, is not representative of the whole child population, but only of patients of the Department of Health dental clinics in New York City. Because of the dental policies and technics employed, the application of these data to other dental service programs should be made with caution. It may be pointed out, however, that unless treatment is provided for the entire child population the problem of selection by economic status is probably a part of any public dental treatment program, and similar factors of selection will probably apply in most communities.

Averages by Age

The average of each item was calculated for each year of age. The plotting of such averages provides a cross sectional series which is representative of

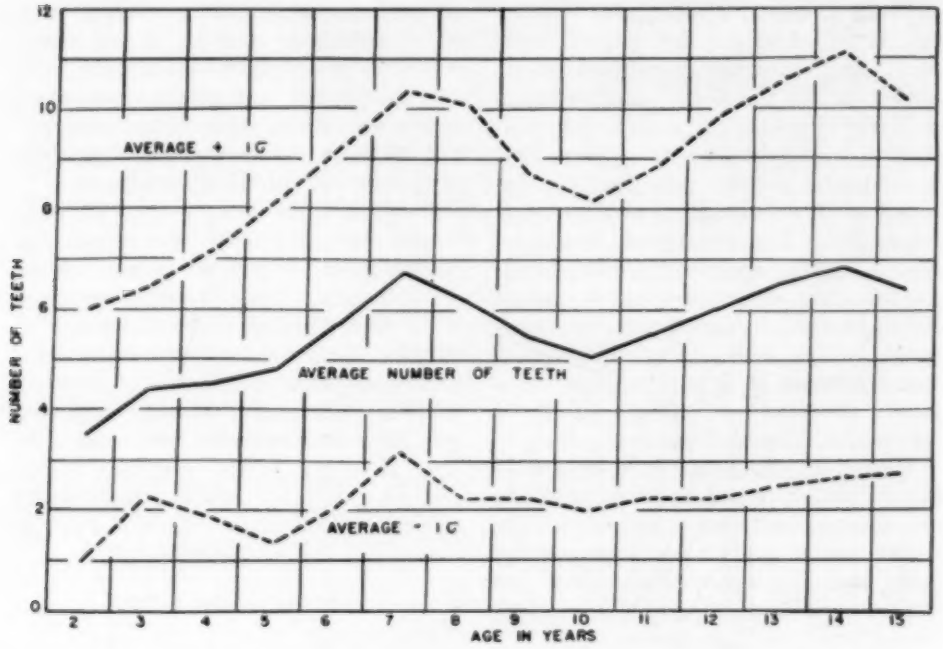

Fig. 1.—Average number of teeth treated (filled or extracted) in 3,282 children during their first complete dental treatment by New York City Department of Health dental clinics, January to June, 1946

Table 1.—Average number of teeth treated (filled or extracted) in 3,282 children during their first complete dental treatment by New York City Department of Health dental clinics, January to June, 1946

Age at last birthday	Children	Avg. No. of teeth treated completely	Standard error of the mean	Avg. No. of permanent teeth treated completely	Standard error of the mean	Avg. No. of deciduous teeth treated completely	Standrad error of the mean
2	19	3.5	2.5	0	—	3.5	2.5
3	60	4.4	2.1	0	—	4.4	2.1
4	95	4.5	2.7	.2	.7	4.3	2.8
5	217	4.8	3.4	.7	1.2	4.2	2.9
6	331	5.7	3.6	1.8	1.6	3.9	2.8
7	331	6.8	3.6	2.7	1.6	4.1	2.9
8	335	6.2	3.9	2.9	1.9	3.2	3.1
9	362	5.5	3.2	3.3	1.8	2.2	2.3
10	373	5.1	3.1	3.5	2.3	1.5	2.1
11	357	5.6	3.3	4.6	3.1	1.0	1.7
12	333	6.1	3.8	5.6	3.7	.5	1.2
13	260	6.6	4.0	6.3	4.1	.3	.8
14	152	6.9	4.2	6.7	4.2	.2	.6
15	57	6.5	3.7	6.4	3.8	.1	.6

the general time trend, and the standard error of the mean for each age provides a reasonably reliable measure of the variation from these averages that may be expected. The graphic representation of these data (Fig. 1) permits an easy estimate of the average number of teeth per child that required treatment at any age, together with a measure of the reliability of these estimates.

Treatment Requirements

Dental treatment involves many services besides the filling and extraction of teeth. In children, however, by far the greatest proportion of time is expended on these two activities. Since the ultimate aim is to save individual teeth the work required by a tooth is a simple measure of accomplishment. The many intangibles that enter into dental treatment are included in the measurements of teeth treated and must be considered a part of the inherent variation in requirements of a tooth.

There is a tendency to emphasize the saving of the permanent teeth and to neglect the deciduous teeth. The present knowledge of orthodontic complications caused by the premature loss of deciduous teeth and the encouragement which these losses offer to subsequent caries and periodontoclasia makes this attitude untenable. The only satisfactory dental treatment for children is complete treatment of all teeth in the mouth, whether deciduous or permanent. It is necessary, therefore, to know what the whole problem involves, and the separation of dentitions in this study is made only for convenience of analysis.

In Table 1 no distinction is made between the kinds of treatment given, filled and extracted teeth being listed together. Figure 1 is a graphic representation of Table 1. The average number of teeth treated increases from 3.5 teeth per child at age 2 to 6.8 teeth per child at age 7. It then falls to 5.1 teeth per child at age 10 and increases thereafter. This curve is characteristic of dental treatment needs. It conforms with the experience of pedodontists and approximates the

Table 2.—Average number of teeth filled and extracted in 3,282 children during their first complete dental treatment by New York City Department of Health dental clinics, January to June, 1946

Age at last birthday	Children	Avg. No. of teeth filled	Avg. No. of permanent teeth filled	Avg. No. of deciduous teeth filled	Avg. No. of teeth extracted	Avg. No. of permanent teeth extracted	Avg. No. of deciduous teeth extracted
2	19	3.5	—	3.5	—	—	—
3	60	4.2	—	4.2	.1	—	.1
4	95	4.1	.2	3.9	.3	—	.3
5	217	4.2	.7	3.5	.7	—	.7
6	331	4.7	1.7	3.0	1.0	—	1.0
7	331	5.4	2.7	2.8	1.4	—	1.4
8	335	4.8	2.9	1.9	1.4	—	1.4
9	362	4.2	3.1	1.0	1.3	.1	1.2
10	373	4.0	3.4	.5	1.1	.1	1.0
11	357	4.8	4.5	.3	.8	.2	.7
12	333	5.7	5.4	.2	.4	.2	.2
13	260	6.1	6.0	.1	.5	.3	.2
14	152	6.5	6.5	—	.4	.3	.1
15	57	6.1	6.0	.1	.4	.4	—

findings in studies of dental caries experience.[7,8,9]

The complexity of the curve is due to the fact that it represents a combination of the caries experience of both the deciduous dentition and the permanent dentition. Each dentition presents different degrees of risk to dental caries attack at the various age levels. In the deciduous dentition the number of teeth exposed to the risk of caries decreases with age. In the permanent dentition the number of teeth exposed to risk increases until all teeth have erupted.

The deciduous dentition presents treatment problems at a much earlier age than the permanent teeth, with considerable overlapping of treatment needs between the ages of 6 and 10. A clearer concept of the progressive nature of dental treatment needs is obtained when each dentition is examined separately.

Although it is common knowledge that caries of deciduous teeth begins early in life, it is not usually realized that the 2 year old child presents dental problems of considerable magnitude. The 2 year old clinic patients had an average of more than three deciduous teeth requiring treatment. The treatment needs increased to almost five deciduous teeth, and then gradually decreased as the deciduous teeth were exfoliated or extracted.

The preventive nature of early treatment of the deciduous teeth is demonstrated by Table 2 and Figure 2. In the youngest children most of the defective teeth were saved, whereas neglect of teeth until the children were older resulted in tooth loss. The ratio of teeth extracted to the total teeth treated was low at age 2 and increased rapidly until about the eighth year of age. Thereafter at least half of the remaining deciduous teeth required extraction. These data point up the urgent need for early dental treatment of the preschool child.

The normal exfoliation of deciduous teeth in addition to the teeth extracted reduced the number of teeth exposed to the risk of caries until, at the thirteenth

7. Sandler, H. C., Insurance of Children Against Caries. *J.A.D.A.* 27:460 (March) 1940.

8. Klein, H.; Palmer, C. E., and Knutson, J. W., Studies on Dental Caries. I. Dental Status and Dental Needs of Elementary School Children. *Pub. Health Rep.* 53:751 (May 13) 1938.

9. Finn, S. B., Second Annual Progress Report on Fluoride Investigations. *New York D. J.* 13:78 (February) 1947.

year of age, almost all of the deciduous teeth were lost. The reduction in the volume of treatment corresponds to a reduction of tooth population as the child grows older and should not be taken to mean that caries susceptibility has decreased.

In a group of older children a few will have retained deciduous roots that require extraction, and a small percentage with congenitally absent permanent teeth will retain deciduous teeth through life, which may require filling. It must be expected, therefore, that the reduction of treatment needs will approach zero but never quite reach it.

If any one tooth could be selected as more important than any other, it would be the first permanent molar. It is the first permanent tooth to appear and it plays an important role in the development of the jaws and alveolar processes and in the maintenance of normal maxillary relations during the change of dentitions. The loss of this tooth can be traced as the cause of drifting of teeth, unbalanced occlusion, and increased susceptibility to caries and periodontoclasia.[10] Yet it is by far the most susceptible to caries and the most frequently extracted. For example, Cheyne and Drain[11] found that in a group of 8,677 school children there were 520 permanent teeth lost, of which 462 were first permanent molars. The prevention of the loss of this one tooth would be a tremendous step forward in the maintenance of the dental health of children and adults.

The problems of the permanent dentition begin with the appearance of the first permanent molar between the fifth and sixth year of age. Although thousands of permanent teeth were treated

10. Salzmann, J. A., A Study of Orthodontic and Facial Changes, and Effects on Dentition Attending the Loss of First Molars in Five Hundred Adolescents. *J.A.D.A. & D. Cosmos* 25:899 (June) 1938.

11. Cheyne, V. D., and Drain, C. L., Dental Caries and Permanent Tooth Extraction; A Study by Age, Sex, and Location of the Incidence of First Permanent Molar Extraction in 8,677 School Children. *J. D. Res.* 19:571 (December) 1940.

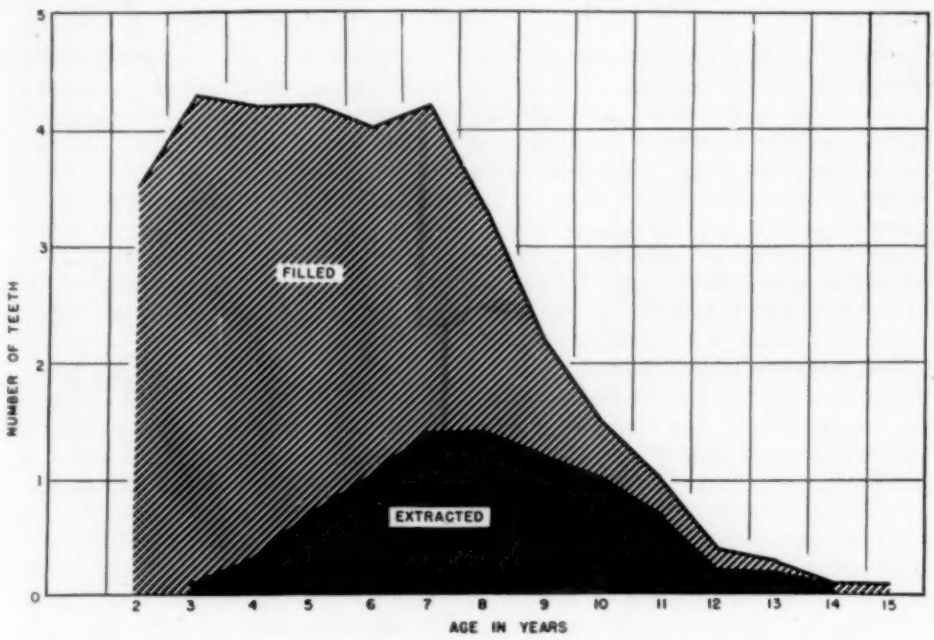

Fig. 2.—Average number of deciduous teeth filled or extracted

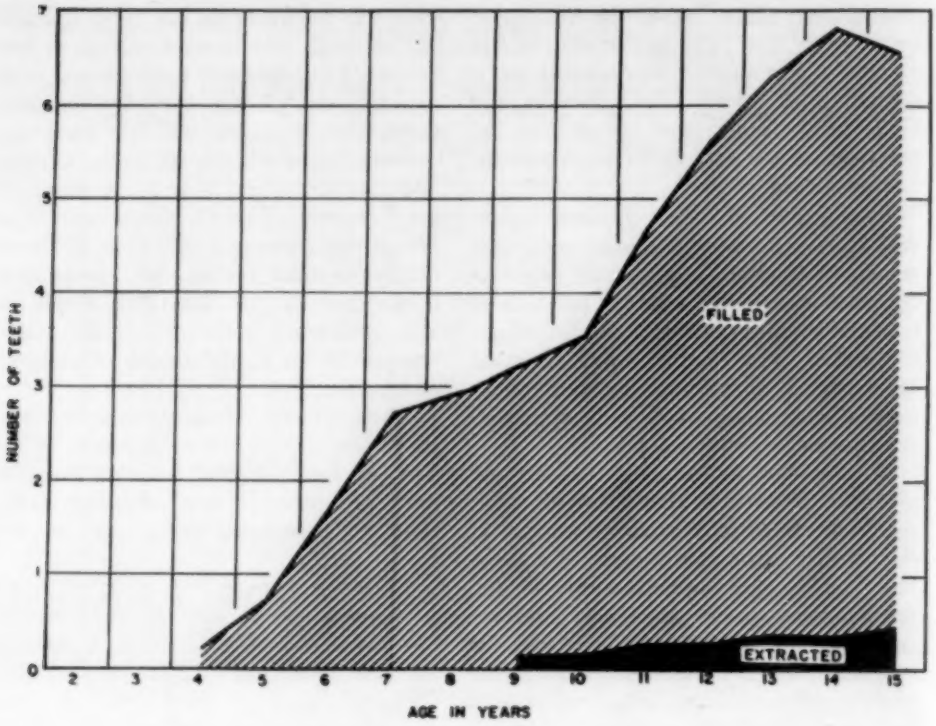

Fig. 3.—Average number of permanent teeth filled or extracted

in these children, it was not until the ninth year of age that the extraction of a permanent tooth was required (Fig. 3). Thereafter the extraction rate increased gradually. Since the only permanent teeth normally present at 9 years of age are the incisors and the first permanent molars, and since experience indicates that the incisors very rarely are carious at this age, the problem concerns chiefly the first permanent molars. It would seem, therefore, that if the loss of carious first permanent molars is to be prevented it is important that children receive proper dental treatment before the ninth year of age.

It is of interest that the increase of carious permanent teeth up to the age of 9 years follows a typical S shaped growth curve. The upper asymptote is determined by the four first permanent molars and the lower limit is zero (Fig. 4). As the first permanent molars erupt there is a gradual, and then a rapid, increase in the number that require treatment until about the eighth year, when three out of every four first permanent molars need treatment. Thereafter, the average number of permanent teeth requiring treatment continues to increase more slowly and irregularly, until at age 15 about seven teeth per child require treatment.

Number and Length of Visits

Although each visit of a patient does not require exactly the same amount of time, the average number of patients seen by the dentists in an hour can be estimated. Between January and June, 1947, there were 90,532 visits to the dentists, and the dentists worked 13,553 sessions of three hours each. The number of patient visits a session averaged 6.7, and

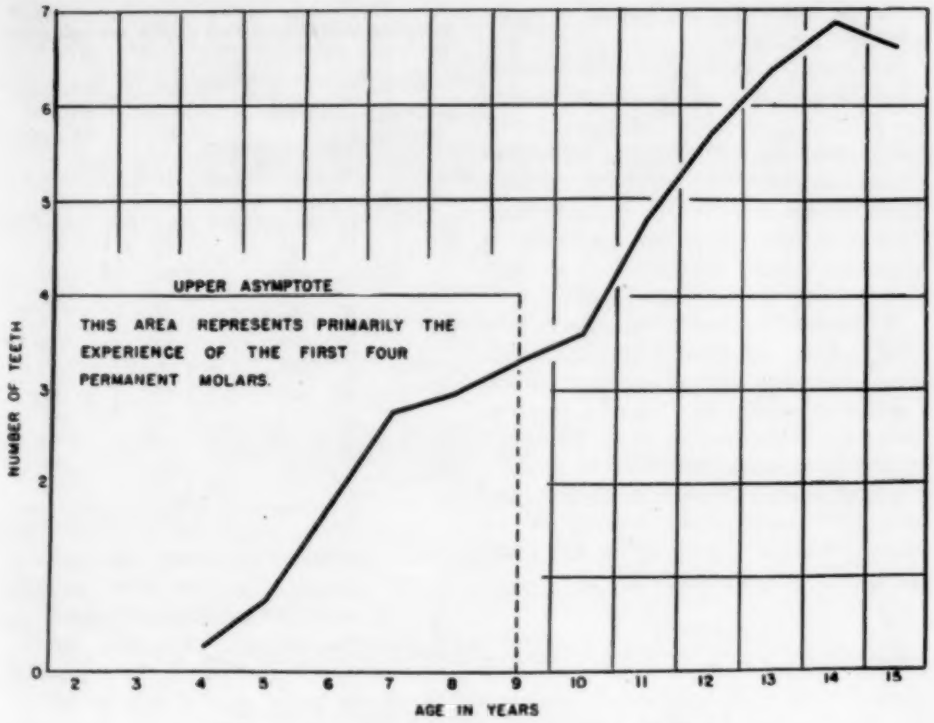

Fig. 4.—Average number of permanent teeth filled

the standard error of the mean was 0.7. Thus, the average number of visits an hour was 2.23.

Each patient seen by the dentist requires the setting up of the bracket table, washing of hands, inspection of the mouth, selection of instruments, some measure of clerical time and often the administration of an anesthetic agent. These items, while not strictly productive, are nonetheless essential to the proper conduct of a dental service.

Other factors which increased the average number of visits for each filling or extraction were: (1) the policy of having every child return for postoperative examination and treatment after every extraction, (2) all fillings were polished, (3) the frequent use of bitewing roentgenograms to check on the work and (4) the visits required for other treatments, such as treatment of gingivitis and emergency toothaches, were not separated from those used for fillings or extractions.

The complete treatment of an average tooth required about one and a half visits (Table 3). This average represents teeth that required several fillings as well as teeth that required only one filling. It is particularly noteworthy that the average number of visits per tooth completed did not vary much with age. Furthermore, the standard errors of the means are remarkably constant. The teeth of older children are apt to have more surfaces involved, and the individual fillings are more difficult and time consuming. On the other hand, the tolerance of the younger child is much lower and he must be treated with greater consideration and patience. In view of the remarkable similarity of the number of visits required per tooth for each age,

it would seem that one factor compensates for the other.

Since on the average a tooth required 1.5 patient visits and the dentist treated 6.7 patients per session of three hours, the average number of teeth completed (filled or extracted) in a three hour dental session is 4.5 teeth. In an average hour a dentist completed 1.5 teeth, or about 40 minutes was required to completely treat the average tooth.

A six months' summary (January to June) of the activities of all clinics indicates that the average number of extractions a session was 0.9 of a tooth or about 0.3 extractions an hour. This leads to the conclusion that on the average a dentist treats 2.23 patients an hour, and that he completes an average of 1.5 teeth, of which 1.2 teeth are filled and 0.3 of a tooth is extracted.

Table 3.—Average number of visits required to complete dental treatment on the average tooth

Age at last birthday	Children	Avg. No. of visits per tooth	Standard error of the mean
2	19	1.51	.82
3	60	1.47	.66
4	95	1.40	.59
5	217	1.52	.57
6	331	1.48	.60
7	331	1.50	.52
8	355	1.47	.55
9	362	1.50	.60
10	373	1.50	.60
11	357	1.55	.57
12	333	1.49	.55
13	260	1.52	.50
14	152	1.55	.65
15	57	1.54	.54

Summary

The Department of Health of New York City provides free dental treatment for the children of parents who cannot afford to pay for private treatment. A group of 3,282 children who received complete dental treatment for the first time was studied, to determine the dental treatment needs of free clinic patients and how much they vary, to estimate the amount of dentist time required and to study the factors which may influence variation in dental needs.

1. When all teeth were considered regardless of whether they were deciduous or permanent, it was found that the average number of teeth that required treatment increased from 3.5 teeth a child at age 2 to 6.8 teeth a child at age 7. The average then fell to 5.1 teeth a child at age 10 and increased thereafter to about seven teeth.

2. The importance of early treatment of the deciduous teeth is emphasized by the fact that the 2 year old patients averaged more than three teeth that required treatment. Although at 2 years of age almost all the carious deciduous teeth could be saved by filling, the ratio of teeth extracted to the total number treated increased rapidly until about the eighth year of age. Thereafter, on the average, at least half of the remaining deciduous teeth treated had to be extracted.

3. The treatment needs of the permanent dentition begin with the eruption of the first permanent molars, and at age 15 years the average number of permanent teeth requiring treatment is about seven per child. At about the eighth year of age three of every four first permanent molars required treatment. Although thousands of permanent teeth were treated, it was not until the ninth year of age that a first permanent tooth had to be extracted. This would seem to indicate that if the loss of the first permanent molars is to be prevented treatment should be instituted before the ninth year of age.

4. The number of patient visits per completed tooth was about 1.5 visits a tooth regardless of the age of the child.

5. On the average a dentist in a clinic treated 2.23 patients an hour. In that time he completed an average of 1.5 teeth, of which 1.2 teeth were filled and 0.3 of a tooth was extracted.

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EDITORIALS

POLITICAL MANIPULATION OF HEALTH PROGRAMS MAKES PROFESSIONAL UNITY MANDATORY

THE imminence of debate on compulsory health insurance as a political issue in the United States makes it imperative that members of the dental profession discourage disharmony in their own ranks. Factionalism, the destroyer of unity, has no place in Association affairs. This does not imply that differences of opinion should not exist among members.

Honest differences of opinion, discussed rationally at the conference table or debated without heat on the floor of the House of Delegates are healthful, as they stimulate growth. However, the publishing in the dental press of picayunish criticism of councilmen who serve gratuitously for the advancement of dentistry is to be deplored. Such action is not constructive, tends to destroy the solidarity which it has taken the profession years to develop and lends ammunition to the proponents of compulsory health insurance.

Recently the Council on Legislation was subjected to some unjust criticism in one of the dental journals. Most of the criticism was based on opinion, not on facts, and therefore was doubly destructive. The ranks of dentistry are weakened by such articles, as they are bound to raise doubts in the minds of some members.

Dentistry's well established position in the American social order is due primarily to the ability and willingness of its members to function as a well coordinated team in the interest of public health. Any action or any article which tends to disrupt that unity is particularly harmful at this time.

Dentistry in Great Britain is a current example of the effects of disunity. The British dental profession is divided into three groups: the British Dental Association, the

Incorporated Dental Society and the Public Dental Service Association. Representatives of each association, in negotiating with the Ministry of Health, could not speak with authority for members of the other two groups. Fortunately for the American public the dental profession in this country is not exposed to the difficulties of such diversified leadership. It is exposed, however, to small rifts in its own ranks which if permitted to grow will weaken dentistry's line of defense.

At this crucial time the Council on Legislation, which bears the brunt of the Association's fight for good laws and against poor ones, must have the cooperation and confidence of the Association's membership. It is particularly important that the Council have the confidence of leaders in national, state and local dental activities. Destructive and poorly informed criticism in the dental press undermines the activities of the Council, and this in long range means undermining the Association.

COLLIER'S AND COSMOPOLITAN ENTER THE FIELD OF DENTISTRY

The editors of two popular magazines started the year wrong by attempting to prescribe for dental ills and regulate the practice of dentistry by means of printer's ink. *Cosmopolitan,* through its Mr. Morgan, would standardize examinations, treatments and fees, while *Collier's,* with the assistance of Mr. Ratcliff, offers the public a panacea for dental caries before it has been evaluated scientifically by the profession.

Mr. Morgan's hypothesis that dental service can be packaged and dispensed by standardized chain store methods is puerile, and his assumption that dentists, unlike authors, should standardize fees is presumptuous. Criticism of diagnoses, treatment and reconstruction by one unversed in dentistry and without knowledge of all the complicated circumstances surrounding each case is not deserving of publication in a national magazine. Even the most uninformed knows that different dentists use different technics and different types of replacements for the same or similar conditions. Dentists rightfully will be incensed by this article, as its damns an entire profession for the deficiencies of a few of its members. But editors of popular magazines must build circulation, and muckraking is one method of doing so.

Mr. Ratcliff, in *Collier's,* employs the catch title "Has toothache been stopped?" Obviously the answer is "no"; nor will it be stopped by the method he describes until the technic has been proved scientifically sound through controlled studies. Dentistry is anxious to obtain a satisfactory method of preventing dental caries, but it will not be stampeded by pseudoscientific articles in popular magazines into employing treatments that have not passed all the rigorous tests known to dental science.

FIRST NATIONAL CHILDREN'S DENTAL HEALTH DAY, FEBRUARY SEVENTH, AN IMPORTANT DATE IN MODERN DENTISTRY

THE seventh of February this year can be made one of the most important dates in the annals of modern dentistry. It remains for the profession to make it so. Designated by the Association as Children's Dental Health Day, it marks the first time that the importance of dental health for children has been given national recognition.

Under the leadership of the Council on Dental Health, scores of state and local dental societies will observe the occasion by presenting pedodontic programs for their members and educational programs for the community. The success of these initial programs, it is hoped, will stimulate other societies to develop similar programs next year and in the years to follow, so that eventually all American communities will participate in this worthy undertaking.

Children's Dental Health Day is one method, but a very important method, of implementing the Association's three point program of research, education and dental care. The only way that the profession, with its limited personnel, can improve the dental health of the nation is to maintain the mouth in a healthy condition. Obviously the most effective method to accomplish this end is to concentrate attention on children, improve their diets and oral hygiene habits and provide them with early and regular dental service.

This is not a responsibility of the dental profession alone. It is a responsibility that must be shared by others interested in child health. It requires the cooperation of parents, teachers, public health workers and other community leaders. Children's Dental Health Day can be made an important method of bringing about that cooperation.

ANIMAL EXPERIMENTATION ESSENTIAL IN MAN'S FIGHT AGAINST DISEASE

MAN'S successful fight against disease can be attributed in no small part to the intelligent employment of animals by scientists in their search for knowledge. Despite the fact that animal experimentation has demonstrated its essentiality to public welfare, a small but vociferous group of misguided individuals conducts a continuous campaign against the use of animals for experimental purposes. Using

man's inherent love of animals and ignoring the demonstrated blessings of veterinary science the antivivisectionists would cripple dental and medical progress by outlawing experimentation. This year antivivisection bills will be introduced into at least ten state legislatures and no doubt others are contemplated. The passage of any one of these bills will have a serious impact on dental and medical education and scientific research.

It is inconceivable that anyone, even with the most humane intentions, could disregard the contributions which the laboratory animal has made to human progress. Insulin, which has added many useful years to the lives of millions of diabetic patients, was perfected by Banting and Best with the aid of dogs. The liver extract treatment for pernicious anemia might never have been discovered by Whipple had he not used dogs in his studies. Diphtheria antitoxin, vaccines, penicillin, streptomycin, the sulfonamides and anesthetics, all indispensable in the dental and medical world, have been made possible through the use of laboratory animals. In a world that demands, and needs, more and better health service the research worker must be permitted to work unfettered.

The self-styled lovers of animals who constitute the nucleus of the antivivisectionist group should be proud of the contribution which those they love have made to human welfare.

INTERNATIONAL CORRESPONDENCE

NEWS FROM GREAT BRITAIN

Restricted Earnings

On the first Sunday in December British newspapers contained the somewhat startling announcement that dentists' earnings under the National Health Service were to be subject to a cut of 50 per cent if over the rate of £4,800 ($19,200) per annum. This regulation went into force on January 1.

Although it had been known almost since the inception of the Service that the scale of fees was to be reviewed after the first year and that a more permanent scale would be introduced sooner or later, announcement of this new regulation was shocking. While many dentists felt that the revised scale could be expected they believed that the changes would only be introduced after the present scale had been tried for a complete year. Some, of course, professed no surprise at the government's action. It was known that negotiations between the officers of the Ministry of Health and representatives of the profession were taking place. It was assumed that the fee question would occupy a large part of the discussions. This assumption appeared justified when it was whispered that the discussions were progressing very slowly.

It seems that the rising cost of the health services was giving rise to increasing alarm among the ministers in the government and that they were determined to take immediate action. During the discussion with representatives of the profession on December 1 the proposal to limit the earnings was presented. It was suggested that any earnings from the state scheme over £4,200 ($16,800) should be subject to a cut of 50 per cent. This figure was £400 ($1,600) more than the figure for the average remuneration of a dentist in general practice recommended in the Spens' Report. The profession's representatives suggested as an alternative that a committee be formed to go into the whole question of earnings and to make recommendations. The Minister of Health, after due consideration of the profession's suggestion, rejected the proposal but raised the figure to £4,800 ($19,200) which is a figure £1,000 ($4,000) above the estimated average earnings. It will be recalled that the Spens' Report suggested that dentists might work longer hours than was recommended in order to increase their income. It probably was this recommendation, coupled with the great demand for dental treatment, that influenced Health Minister Bevan to allow the increase. Deductions will be made monthly and any application for fees for dental treatment totalling more than £400 ($1,600) in a month will be subject to the new regulation. For example, an application for payment of fees totalling £500 in one month would bring the dentist only £450 ($1,800). Taking it another way; a dentist wanting to earn £500 ($2,000) a month will be required to complete £600 ($2,400) worth of treatment. However, there is nothing to prevent a dentist from holding back for the next month any completed forms which would total his income over the £400 ($1,600) line. In this way holidays can be taken and no marked drop in income registered.

Each month is considered as an entity and it is not permissible to carry from one month to another any sum below the £400 ($1,600) to compensate for a larger amount at a given time.

It is reported that at the meeting the government's representatives produced evidence to show that 95 dentists were claiming £1,000 ($4,000) a month for dental treatment given by them under the scheme. It is the opinion of many dentists that to earn £400 ($1,600) a

month is hard going, especially if the bulk of the work done is conservation of teeth. It was stated in the House of Commons recently that of all the fees paid to dentists up to the end of October, 40 per cent were for dentures.

The main objection voiced by the dental practitioners is not so much that a ceiling has been imposed upon them since it is realized that the earnings of a general medical practitioner in the Health Service are limited by the fact that he may have only 4,000 state patients and he is paid for the number of patients and not for treatment given. The dentists, however, dislike the government's unilateral action without full discussion.

A Statement by the British Dental Association

"The Council of the British Dental Association at a meeting held on December 11 considered the action of the Minister of Health in deciding to halve, by regulation, the earnings of all dentists under the National Health Service exceeding an arbitrarily selected maximum. This action has been taken by the Minister without any investigation of the alleged incomes or of the circumstances in which they are being earned and without any opportunity being given to the profession to make such an investigation.

"The British Dental Association has consistently fought against the present scheme on the grounds that payment by a fixed scale of fees was bound to result in a lowering of standards.

"It has consistently advocated remuneration by a system of grant-in-aid as the best method both to ensure a high standard of treatment and to safeguard the public purse.

"The Association emphatically condemns the action of the Minister [of Health] in limiting, by regulation, the earnings of dentists who are working extremely long hours in the effort to provide the service which the public has demanded. His action, in the opinion of the Association, is an attack on the liberty of the individual and is against public interest as leading to the inevitable curtailment of an essential health service.

"The Association has been invited by the Minister [of Health] to appoint representatives to watch the operation of the amending regulation and to advise on any necessary modification. It is not prepared to do this until a clearer definition of the functions and duties of such observers is available and is replying at once to the Minister to this effect."

Fuel Cuts

The continuing shortage of electric generators needed to produce all the electricity required in Britain has been given as the reason for cuts imposed on domestic and commercial users during the winter months. The majority of dentists pay commercial rates for their current since most dental equipment is electrified. They were disturbed to receive a circular requiring them to restrict their use of electricity to 50 per cent of the installed capacity of their equipment. The Minister of Fuel and Power recognizes the special position of dentists and has made it known that he did not seek to restrict their practice, but to the practitioner the regulation means extra work since he must communicate with the local electricity manager to state his case.

Dental Trade Show

The Dental Trade Exhibition, the first since the war, was revived recently and it was apparent that British manufacturers have vastly expanded their operations. Particularly attractive to dentists attending the show were the displays of acrylic teeth. A number of orders were placed for the newly introduced water-jet attachments to dental handpieces and a portable unit received much attention.

It was gratifying to learn that there would be little delay in the delivery of new equipment.

A Report on Caries

A recently released report on caries in London school children which covers a study made in 1947 shows that 28.1 per cent of those examined were found to be caries free. The figures cover only deciduous teeth.

The 1947 study is a continuation of others conducted in 1929, 1943 and 1945. A progressive decrease in the number of children with caries is shown. In 1929 slightly less than 5 per cent were caries free, while in 1943 the number had jumped to 14.9 per cent and in 1945 it was 24.2 per cent.

An estimate of the enamel structure by stroking the tooth with a sharp probe indicated that 30.7 per cent in 1943, 38 per cent in 1945 and 47.1 per cent in 1947 had well formed enamel.

The improvement shown in this survey is attributed to the adequate diet of both the mother and child since all the children studied were born during the period of food rationing wherein expectant mothers and children were given special concessions. During this period there also was a considerable reduction in sugar consumption and the flour extraction was lowered. — *John R. Boyes, Newcastle Upon Tyne, England.*

THE NATIONAL SCENE

from the Journal's Washington Correspondent

January, in the Nation's Capital, was a memorable month, yet one whose significant events were but an overture to the movements that lie ahead. A President was inaugurated but only time will tell how far the determined Mr. Truman will get toward effectuation of a domestic program which even his partisans acknowledge to be on the socialistic side.

In the first two weeks of the first session of the new Congress, considerably more than 2,000 bills and resolutions were introduced. When they get through checking the archives it probably will be found that this figure set a new record, yet the filing of a bill is only the first preliminary toward enactment. The real struggles will come this month and in March and into late spring and possibly the summer, after the honeymoon of the Democratic President and a Democratic Congress has ended.

January in Washington resounded to speeches and statements and radio talks in favor of compulsory health insurance, federal assistance to dental and medical education, elevation of Federal Security Agency (including its component U.S. Public Health Service) to department status at Cabinet level and thorough overhauling of the government's medical and public health operations—including Army, Navy and Veterans Administration. But as for action . . . that is yet to come.

Of specific interest and importance to dentistry, these January preliminaries included, in addition to the broad issues sketched above, the first meeting of Secretary of Defense James E. Forrestal's new Armed Forces Medical Advisory Committee, the first meeting of the government's new National Advisory Dental Research Council, a conference of Federal Security Administrator Oscar R. Ewing with dental educators and officials of A.D.A., reorganization of the dental study section in National Institutes of Health and, scheduled for January 28-29, a joint conference of honorary and reserve consultants to Navy's Bureau of Medicine and Surgery in dentistry, medicine and the allied sciences.

No concrete action was taken by the Forrestal advisory group, which devoted its two-day session to getting acquainted with one another and discussing recommendations of the Hawley Board on reduction and consolidation of military hospital facilities. Walter H. Scherer, sole dental member of the committee, came from Houston to attend its initial meeting. Another session has been scheduled for late February. With Secretary Forrestal evidently a pat member of the Truman cabinet, this advisory committee must be regarded as an important one whose recommendations on administration of the Army and Navy dental services, raising and lowering of medical and dental manpower, postgraduate education of commissioned personnel, logistics and the reserve program will carry considerable weight.

Paucity of Dental Research Funds Cited

The paucity of funds available, governmental as well as private, for research in dental disease problems may be said to have been the theme of the organization meeting of the National Advisory Dental Research Council. H. Trendley Dean, director of the National Institute of Den-

tal Research established last year by Congress, told the 12-member council that less than $1,000,000 is being spent annually in this country for dental research, or one-tenth of one per cent of the amount paid to dentists for remedial services. This, he asserted, compared with $110,000,000 invested annually in medical research, or six per cent of the total spent for medical bills.

Dr. Dean's argument is dramatically illustrated by the 1950 budget which President Truman submitted to Congress for approval on Jan. 10. For "promotion of public health," it allocates $234,000,000 to Federal Security Agency, exclusive of $15,000,000 provided for initial administrative costs of the proposed national health insurance program. There are many millions for cancer, heart and mental hygiene research but only $412,922 for dental investigations. One half that sum is proposed for intramural research at the Institute and the remainder for grants-in-aid to non-federal institutions. A mere $35,000 is allocated for fellowships and traineeships. For aid to states in conduct of dental health control measures, $1,208,720 is provided. Next meeting of the group was set for June 3.

National Health Insurance Legislation

FSA Administrator Ewing would volunteer no comment on his conference early in January with representatives of the Association of American Dental Colleges and A.D.A. However, there are definite signs that, having been convinced medical, dental, nursing and public health education are receptive to federal support, Ewing has plans for an ambitious "one package" health program. If this is so, he may abandon attempts to obtain Congressional enactment of a bill providing only for compulsory health insurance along the Murray-Wagner-Dingell line. Instead, his assistants will draft a measure combining the M-W-D scheme with such relatively noncontroversial attendant features as aid to professional education, expansion of the Hill-Burton hospital construction program and federal subsidization of local public health units. In any case, this much appears certain: The present M-W-D bill (S.5) will be modified radically in committee before it reaches the floor of House or Senate for a vote. The Truman-Ewing strategy, of course, will be to expedite passage of national health insurance legislation by sugar coating it with features designed to win local support.

January witnessed the new year's first meeting of the Dental Study Section, National Institute of Health, whose chief function is to appraise applications for federal research funds in this particular field. New members of the section are Allan G. Brodie, of University of Illinois college of dentistry, and Thomas J. Hill, of Western Reserve University. No longer a member is Isaac Schour, of University of Illinois, whose term of service expired Jan. 1 along with those of some 35 members of various other study sections.

As for Navy Surgeon General Clifford A. Swanson's conference of honorary and reserve consultants at National Naval Medical Center Jan. 28-29, obviously its results can not be discussed in this issue of the Journal. Clyde E. Minges, A.D.A. president, and Daniel F. Lynch, A.D.A. fourth district trustee, were scheduled to be among the conferees.

LEGISLATION

THREE COMPULSORY HEALTH INSURANCE BILLS BEFORE CONGRESS; $15 MILLION ASKED AS STARTER

Three separate bills to provide a system of compulsory health insurance were introduced during the first week of the 81st Congress and at present are entangled with some 2,000 other bills presented since the opening session Jan. 3. President Truman, however, indirectly gave priority to the bills when he asked for a $15,000,000 appropriation to get a program of compulsory health insurance under way.

The new bills, all identical with the old Murray-Wagner-Dingell bill (S.1320) which remained in committee in the 80th Congress, were introduced by a group of administration minded Senators and Representatives. Senator Murray (D., Mont.) introduced bill S.5 for himself and Senators Taylor (D., Idaho), Wagner (D., N. Y.), Chavez (D., N. M.) and McGrath (D., R. I.) while Representative Dingell proposed bill H.R. 783 and Representative Celler (D., N. Y.) introduced bill H.R. 345.

Referral of the bills was split among three committees with the Senate measure going to the Committee on Labor and Public Welfare, Representative Celler's bill to the Committee on Ways and Means and Representative Dingell's bill to the Committee on Interstate and Foreign Commerce. No explanation has yet been made for the reference of identical bills to two separate committees of the House.

In the past, bills relating to Social Security have habitually been sent to the Committee on Ways and Means which has primary jurisdiction over bills for raising taxes.

In preparation for coming hearings on the bills which may start this month, proponents of compulsory health insurance have been making a concerted effort to reach the public ear. Speeches have been given before labor organizations and others pointing up that under national compulsory health insurance 85 per cent of the population would be protected against dental, medical and related expenses.

Digest of New Health Insurance Bill

Meanwhile the A.D.A. Council on Legislation has been busy preparing background material with which to oppose the compulsory health insurance bills in Congress. Council Secretary Francis J. Garvey also has prepared a digest of the 84-page bill which eliminates the legalistic intricacies. The digest follows:

"The dental profession is definitely included in the bills. Title II specifies what prepaid personal health benefits are to be made available to eligible individuals. Included in the list are medical services, dental services, home nursing services, hospital services and auxiliary services. Dental services are to consist of two classes: (1) general dental services rendered by a general practitioner including preventive, diagnostic and therapeutic care, and periodical examinations; (2) specialist services to be rendered by an individual who meets standards and qualifications to be prescribed by the National Health Insurance Board after consultation with the National Advisory Medical Policy Council, both of which agencies are established by the bill. Persons qualifying as specialists are to be entitled to

'specialist compensation' for services.

"Also of some interest to dentists are the provisions for auxiliary services to consist of chemical, bacteriologic, pathologic, diagnostic x-ray and related services; x-ray, radium and related therapy; . . . prescribed drugs which are unusually expensive and special appliances. The Board, after consultation with the Council, is to designate by regulation the auxiliary services to be made available.

"All types of services are to be offered to eligible individuals as rapidly as possible in areas where professional and technical personnel and facilities are available. If the Board finds that personnel, facilities or funds are inadequate to provide all services it may limit or modify those to be rendered. Where dental services are limited by regulation, priority is to be given to children.

Right of Selection

"Each eligible individual is given the right to select the general practitioner, specialist or hospital facility of his own choice from among those who have agreed to participate in the plan. Thereafter, at any time, the individual may change such selection, or the practitioner or specialist, consistent with professional obligations, may determine no longer to treat such individual. Specialist treatment is to be obtained generally by referral from a general practitioner. An administrative medical officer may, in certain cases make a referral to a specialist upon the request of the eligible individual.

"Any individual who is qualified to render any health service proposed to be provided under the Act may enter into an agreement with a state agency to furnish services to eligible individuals. Similarly, agreements may be entered into with organized groups of individuals, with partnerships, associations or consumer cooperatives, with any hospital or any hospital and its staff or with any organization operating a voluntary health-service insurance plan or other voluntary health service plan.

"Each agreement is to set out the classes of service which are to be rendered and the practitioner must agree to comply with the law and regulations under it. The agreement shall be for a mutually agreeable period and may be terminated according to the terms of the agreement. Practitioners who enter into an agreement and are subsequently found by the state agency no longer qualified to render the services agreed upon or who commit a substantial breach of the agreement may be released. They would however have the right to know the charges preferred against them and to have a hearing thereon.

Method of Compensation

"Agreements to furnish general medical or dental service may specify that the practitioner be compensated in any of the following ways:

(1) on a fee for service basis under a fee schedule;
(2) on a per capita basis according to the number of eligible individuals on the practitioner's list (the panel system);
(3) on a salary basis, full or part time;
(4) on a combination of the above with a separate provision for travel and related expenses.

"It is generally contemplated that the method of remuneration will be more or less uniform in each health service area as the majority of practitioners agree. However, if it is found that an alternative method of payment promotes the efficient and economical administration of benefits in an area, provision may be made for such an alternative method of paying those practitioners who do not elect the method of the majority.

"Specialist service agreements may provide for the payment of fees on the basis of fees for service, per case, per

session, per capita, on salary (full or part time) or any other basis or combination of several bases.

"Rates of payment are to take into account relevant regional, state or local conditions and practices. Attention is to be paid to the annual income or equivalent which the payments will provide and consideration is to be given to the degree of specialization, skill, experience and responsibility required in rendering the agreed services. To maintain high standards of quality of service the state agency may set a maximum number of eligible individuals who may be treated by any one practitioner.

"Agreements may be terminated after reasonable notice and suitable arrangements to fulfill professional obligations existing at the time. Practitioners agreeing to render services under the Act are to be free to practice in a locality of their own choosing, consistent with applicable state law and may accept or reject patients in accordance with state law and customary professional ethics.

Determination of Eligibility

"A rather complicated formula is provided to determine individual eligibility to receive benefits. Two terms are important to the determination of eligibility. One is 'benefit year' which is the same as a federal fiscal year or the period between July 1 of any given calendar year and June 30 of the succeeding calendar year; the other is 'calendar quarter' which is any period of three months ending either March 31, June 30, September 30 or December 31.

"An employed individual is eligible for benefits during any benefit year if during the first four of the six calendar quarters immediately preceding the benefit year he earned $150 per quarter either from wages or self-employed income. For example, an individual would be eligible for benefits during the benefit year beginning July 1, 1949 if he earned $150 during each calendar quarter of 1948. It is not necessary that he should have earned any money during the two quarters immediately preceding the benefit year.

"An individual who cannot meet the eligibility test set out in the preceding paragraph may be eligible, in any event, if he had earned $50 per calendar quarter in six of the first twelve of the fourteen quarters preceding the beginning of the calendar year. For example: to be eligible for benefits in the benefit year commencing July 1, 1951, the individual, in this case, must have earned at least $50 per quarter in six of the twelve quarters between January 1, 1949 and January 1, 1951.

"In addition to the two classes of employed persons set out above any one entitled to Old Age and Survivor's Insurance, or to Civil Service Retirement benefits, or who is a dependent of an eligible individual, in the first month of a benefit year, is also entitled to benefits.

"Persons eligible to receive benefits under workmen's compensation acts would not be entitled to receive services under this act for the same injuries or disease. However, the two agencies administering the Acts, could agree that the workmen's compensation agency would reimburse the National Health Insurance Board, or the local administrative group, and in such cases this excluded class would receive benefits under this Act.

"Likewise, needy persons who cannot qualify for benefits under this Act may receive such benefits if the public agency responsible for such needy person enters into an agreement with the Board to have such services rendered. Federal grants to the states under the Social Security Act for the purposes of old age assistance, aid to dependent children and aid to the blind are made available to the states for the provision of personal health services to needy individuals.

"The Federal Security Administrator, through such units of the Federal Se-

curity Agency as he may determine, is charged with determining the eligibility of individuals for benefits under the Act.

"The general administrative scheme follows the familiar federal-state pattern. An over-all federal administrative agency, in this case the National Health Insurance Board, is provided to administer the Act at the federal level. States are then to enact laws setting up state and local administrative agencies on a plan which must be in conformity with federal regulations and approved by the National Board. The federal agency then disburses to the states the money necessary to finance the scheme. If any state does not present an approved plan within a reasonable time (as specified in the Act) the Board must notify the Governor of the state that the plan will be administered by the Board in such state until one year after the submission and approval of an acceptable plan of operation by the state. If the Board finds that a state is not complying with the provisions of a plan or has failed to make a change required by the board it may step in and operate the plan in the state.

"There are no provisions for taxes made by the bill similar to those contained in the Social Security Act. Instead a trust fund is created in the Federal Treasury, to be known as the 'Personal Health Services Account' and the Congress is directed to appropriate funds into such account. It is intended that two separate appropriations be made to the fund. One would amount to three per cent of all earnings of employed individuals (including self-employed) up to $3,600 per year. To meet the cost of furnishing dental services, home nursing services and any other sums required to be expended to carry out the Act, an additional one-half of one per cent would be appropriated during the fiscal years 1950, 1951 and 1952. This rate would rise to one per cent during fiscal years 1953 through 1955, and thereafter the rate would be based upon the average of all wages received during the three fiscal years preceding the year for which the next appropriation was to be made.

"All persons are not included in the definition of employment. Consequently their earnings would not be computed in making the appropriation to the fund and, presumably, they would not be entitled to the benefits of the Act. Chief among the excluded employments are: active military and naval service; state governments, local political subdivisions and any wholly owned instrumentality thereof; employment as an employee or employee representative as defined by the Railroad Retirement Act; by a foreign government or wholly owned subsidiary or by an international organization recognized under the International Organizations Immunities Act.

National Health Insurance Board

"The Act will generally be administered, if enacted, by the National Health Insurance Board, which would be a constituent agency of the Federal Security Agency, to be composed of five members. Three of these would be appointed directly by the President while the other two would be the Surgeon General and the Social Security Commissioner who would serve ex-officio. The Board itself would be under the direction and supervision of the Federal Security Administrator. The Board would utilize its own employees for fulfilling its functions under the Act and would be entitled to necessary assistance from other federal departments and agencies.

"To advise the Board, the Act proposes to create a sixteen member National Advisory Council, with the chairman of the Board as ex-officio chairman of the Council. Council members would be appointed by the Federal Security Administrator and would be compensated on a 'when actually employed' basis with per diem and travel expense. The Council would advise the Board with ref-

erence to matters of general policy and administration arising in connection with the making of regulations, establishment of professional standards and the performance of its other duties.

Act to Be Administered on Local Basis

"It is intended that the Act shall be administered on a local basis under the direction of state-wide administrations. For this purpose each state which desires to administer the benefits in its own jurisdiction may set up a state-wide administrative agency to supervise the carrying out of the Act. In general this will be accomplished through the utilization of existing welfare agencies and the submission for approval of a plan which will provide for decentralized administration of the Act within the state to local health areas. Each state agency will have its own employees, and will also have the assistance of a state advisory committee similar to the National Advisory Council. Where the state does not provide an administrative agency, the Board will operate the Act in such state in lieu of the state's own agency.

"The plan actually will be operated at the 'local health area' level. Formation of a local health area, its size and general make-up for each state will be outlined in the plan approving the establishment of the state-wide agency. Administration at this level will be in the hands of either a local administrative officer or a local administrative committee. If a local administrative committee system is used then such committee will have an executive officer as its administrator.

"The committee or officer will act with the advice of local professional committees and will arrange to furnish the various personal health services contemplated by the Act to eligible individuals. It or he will be responsible for publishing the names of those who have agreed to furnish health services under the Act, for disseminating information concerning the Act, for the prompt payment of those who render services under the Act, for the adjustment of complaints within the local area and for the local administration of the Act.

"Each area will have a local professional committee consisting of local practitioners to assist the committee in maintaining the customary freedom and responsibility of practitioners in the exercise of professional judgment as to the care of patients and in the solution of technical problems concerning the participation of professional personnel and to advise with regard to matters of professional practice or conduct.

"The local administrative officer or local executive officer will be a state employee, as will those personnel employed by the state agency at that level. An anomaly arises out of this in that those administering the plan at state and local levels may not be themselves eligible for its benefits, since state employees appear to be excluded.

"Where, in rural areas, the results of a survey by the state agency indicate a shortage of professional and technical personnel and facilities, a special program is to be developed for such area to include guarantees of minimum income to participants, travel expenses of participants to the area and loans to individuals who set up practices in such areas for the purchase of essential office equipment.

Hearing Boards

"A system of hearing boards for determining complaints of beneficiaries and participating practitioners is contemplated. In addition, the powers and exercise of the powers of state agencies are subject to review by state courts and ultimately by the United States Supreme Court.

"Section 273 of the bill authorizes the Board to make and administer grants-in-aid to non-profit research organizations

and to institutions teaching graduate and undergraduate professional students. Institutions desiring such grants must apply to the Board which may make the grant upon the advice of the Advisory Council (after consultation with other federal agencies concerned with professional education) that the project shows promise of making valuable contributions to the education or training of persons useful to or needed in furnishing medical, dental, nursing or hospital services under the Act.

Act Consists of Three Titles

"The Act generally consists of three titles. The material so far analyzed is contained in title II which may be said to be the Health Insurance Title. Of the remaining titles, Title I is a policy section reciting the findings of Congress as to the need for legislation of this sort and containing general policy directives which the Board will ultimately look to for the justification of regulations where no specific section of title II covers the subject matter.

"Title III deals with the expansion of health services in the states. It contemplates grants-in-aid to the various states and their political subdivisions for the expansion of basic services, the maintenance and improvement of maternal and child health services, the development of services relating to the detection and prevention of the more prevalent and serious diseases, the establishment of services for the aged and chronically ill and the training of personnel to render such services. Under the system contemplated, states would submit plans for the approval of the Federal Security Administrator who would then make allotments to states on the basis of (a) their population and (b) their financial resources. The health services contemplated for all groups under Title III includes the provision of medical, dental and hospital care and related services.

"The effective date of title II under the Murray bill (S.5), would be the date of its enactment but personal health services would not become available as benefits until July 1, 1951. Title III would apparently become effective upon passage of the bill. It should be noted that these effective dates will be meaningless unless the Congress passes separate appropriation bills making available the funds necessary to carry out the provisions of titles II and III."

A. D. A. AFFAIRS

A.D.A. BOARD OF TRUSTEES TO DISCUSS NATIONAL HEALTH ISSUE

A three-day meeting of the A.D.A. Board of Trustees will be held early in this month to discuss Association policies relating to federal health legislation, the status of Association programs and projects and a proposed program of public information on national compulsory health insurance. The Board will convene Feb. 5 and intends to conclude its session Feb. 7.

Discussion of Association action on compulsory health insurance legislation, the most important health issue facing the Congress this year, is expected to receive much attention in the Board's sessions. The information and education program prepared by a committee of Central Office staff members for the consideration of the Board of Trustees calls for a budget of about $65,000.

Other important federal legislation which will draw attention includes the not yet released draft bill designed to break the shortage of dentists, physicians and other professional personnel in the

Army, Navy and Air Force; a bill to create administrative parity between the Army Medical and Dental Corps now being prepared by the Council on Legislation and a request to Congress for a declaration of the first Monday in February as National Children's Dental Health Day. (President Truman has refused to issue a proclamation to that effect, referring the Association's request to the Congress instead.) The possibility of legislation being entered in Congress which would appropriate the authorized $2,750,000 for construction and operation of the National Institute of Dental Research also may be discussed.

Members of the Board of Trustees representing the Association's 13 districts are:

William McGill Burns, Brooklyn, second district; R. C. Dalgleish, Salt Lake City, thirteenth district; Willard Ogle, Dallas, Texas, twelfth district; Fred S. Shandley, Seattle, eleventh district; LeRoy M. Ennis, Philadelphia, third district; James E. John, Sr., Roanoke, Va., fifth district; Daniel F. Lynch, Washington, D. C., fourth district; Obed H. Moen, Watertown, Wis., ninth district; Harold W. Oppice, Chicago, eighth district; J. B. Carr, Indianapolis, seventh district; C. S. Foster, Cedar Rapids, Iowa, tenth district; Henry Hicks, Greenwich, Conn., first district and Robert P. Thomas, Louisville, Ky., sixth district.

In addition, a number of A.D.A. Councils will meet in the Central Office early this month. A joint session of the Council on Dental Therapeutics and the Advisory Committee to the Bureau of Chemistry will be held Feb. 3-4 and a session of these two agencies with the Council on Dental Research is scheduled for Feb. 5. The Council on Dental Research will hold its own meeting Feb. 6. The Council on Dental Education will meet Feb. 4 while the Council on Legislation has scheduled sessions for Feb. 5. On Feb. 9 the Council on Scientific Session will meet with newly appointed section officers. Also scheduled but without set dates are meetings of the Councils on Insurance and Dental Trade and Laboratory Relations. The Advisory Committee to the Bureau of Public Information will meet Feb. 6.

JOINT HEADQUARTERS HOTELS NAMED FOR '49 ANNUAL SESSION

Selection of joint headquarters hotels for the 90th annual session of the A.D.A. to be held in San Francisco, Oct. 17-20, was completed recently by the California local arrangements committee and representatives from the Central Office. The two groups met to make preliminary plans for the session.

The hotels selected are the Fairmont and the Mark Hopkins which are across the street from each other. Meetings of the House of Delegates and the convention's one general session will be held in the Fairmont. Scientific and commercial exhibits and scientific meetings will be held in the spacious San Francisco auditorium.

Rapid progress in making preliminary arrangements for the convention in San Francisco was attributed in part to a clarification of the convention program made in December by the A.D.A. Council on Scientific Session. The Council members voted to limit the meeting to four days instead of the usual five and reduce general sessions to one. All of the usual scientific meetings and clinics will be included in the four-day schedule.

It is reported that adequate housing in first class hotels will be available for all visitors and reservations will be handled by a housing bureau operated by the San Francisco Chamber of Commerce. The bureau will be established in June and requests for reservations may be made at that time on a special form to be printed in THE JOURNAL. No requests for hotel reservations should be made except on the official form.

ONLY HALF OF RELIEF FUND GOAL REACHED: TARDY A.D.A. MEMBERS URGED TO CONTRIBUTE

With only about half of the A.D.A Relief Fund's $100,000 goal accounted for, John S. Owens, Chairman of the Council on Relief, has urged Association members who have not yet subscribed to mail their contributions to the A.D.A. immediately.

At the end of the Dec.-Jan. 1 accounting period contributions of only $46,623 had been received from 21,441 of the Association's more than 70,000 members and only two constituent dental societies had reached their quotas.

Placing the need for increased funds on the high cost of living and other present day factors, Dr. Owens renewed the appeal for Relief Fund support. He pointed out that half of each contribution goes to the A.D.A. Relief Fund while the other half is returned to the donor's state society.

The Alabama Dental Association, second of the two organizations to reach its goal, registered 163 per cent of its quota. North Dakota was first to top the 100 per cent mark with 133 per cent of its quota. Returns for the first half of February, while not complete, show that all other state societies are far behind the leaders.

Contributions by constituent societies follow:

	1948-49 Quotas	To Jan. 1 Contributions
Alabama	$ 800.00	$ 1,308.00
Arizona	200.00	119.00
Arkansas	400.00	196.50
Army	400.00	148.50
California	3,550.00	1,988.92
Southern California	4,190.00	2,096.50
Colorado	900.00	78.00
Connecticut	1,950.00	1,356.00
Delaware	100.00	57.00
District of Columbia	900.00	463.00
Florida	1,100.00	606.00
Georgia	1,000.00	441.00
Hawaii	300.00	255.00
Idaho	200.00	150.00
Illinois	7,710.00	4,126.00
Indiana	2,450.00	1,169.00
Iowa	1,950.00	879.25
Kansas	1,160.00	649.92
Kentucky	1,120.00	303.50
Louisiana	1,030.00	329.50
Maine	500.00	214.00
Maryland	1,020.00	460.00
Massachusetts	3,800.00	1,249.00
Michigan	3,900.00	1,912.50
Minnesota	3,140.00	1,422.50
Mississippi	500.00	277.60
Missouri	2,690.00	1,557.00
Montana	400.00	185.50
Navy	500.00	119.50
Nebraska	1,180.00	886.00
Nevada	100.00	46.50
New Hampshire	300.00	136.00
New Jersey	4,170.00	1,911.50
New Mexico	200.00	124.00
New York	15,830.00	6,201.88
North Carolina	1,150.00	395.00
North Dakota	300.00	400.00
Ohio	4,860.00	2,087.33
Oklahoma	900.00	438.50
Oregon	1,115.00	770.00
Panama Canal Zone	30.00	00.00
Puerto Rico	300.00	28.00
Pennsylvania	7,520.00	3,257.50
Pub. Health Service	200.00	49.50
Rhode Island	600.00	178.00
South Carolina	500.00	182.50
South Dakota	400.00	108.00
Tennessee	1,120.00	533.50
Texas	2,900.00	1,271.50
Utah	500.00	51.00
Vermont	200.00	80.00
Vet. Administration	900.00	189.00
Virginia	1,100.00	564.00
Washington	1,640.00	1,052.00
West Virginia	800.00	395.00
Wisconsin	3,070.00	1,063.51
Wyoming	200.00	95.00
TOTALS	$100,000.00	$46,623.41*

* Total contributions include $14 given by three commercial firms.

EWING HOLDS CONFERENCE ON AID TO DENTAL EDUCATION

In an effort to determine dental education's need for federal financial assistance, Federal Security Administrator Oscar Ewing held a conference in Washington, D. C. early last month with dental educators, representatives of the A.D.A. and interested federal officials. The results of the conference have not been disclosed pending the outcome of similar conferences with other health education groups.

General agreement was reached that the nation's dental schools need financial assistance but that acceptance of federal support should in no way jeopardize their autonomy.

In discussing Federal aid to students it was recognized that a large number of dental students now are receiving assistance under the G. I. Bill of Rights. When this assistance is exhausted there will be many able students requiring such aid if they are to study dentistry.

It was pointed out by those attending the meeting that they were present only in an advisory capacity and that "much still remains to be done in regard to additional meetings, further recommendations, preparation of bills and passage of legislation."

Representing the dental schools at the conference were: Russell W. Bunting, University of Michigan; John R. Burke, Georgetown University; M. Don Clawson, Meharry Medical College; Russell A. Dixon, Howard University; J. Ben Robinson, University of Maryland and Gerald D. Timmons, Temple University. J. Roy Blayney and Shailer Peterson, chairman and secretary, respectively, of the Council on Dental Education, represented the A.D.A.

U.S. Public Health Service officials present were: Bruce D. Forsyth, assistant surgeon general and chief, division of dentistry; Vernon J. Forney, assistant chief, division of dentistry; James S. Miller, deputy chief, division of dentistry; H. Trendley Dean, director, National Institute of Dental Research; W. Palmer Dearing, deputy surgeon general and George St. J. Perrott, chief, division of public health methods. Other government personnel attending were Henry G. Badger and Lloyd Blauch, U.S. Office of Education and John T. Fulton, dental services advisor, Children's Bureau. In addition, Basil G. Bibby, director, Eastman Dental Dispensary, Ruben G. Gustavson, chancellor, University of Nebraska and R. Wendell Harrison, vice-president, University of Chicago, attended.

SECOND DENTIST APPOINTED TO DEFENSE ADVISORY COMMITTEE

The appointment of Daniel F. Lynch, A.D.A. Fourth District trustee, to the recently organized Medical Advisory Committee for national defense will be announced soon, according to a late report from Washington, D. C.

Dr. Lynch's appointment will bring to two the number of dentists on the Committee and will raise the Committee's total membership to 14. Walter H. Scherer, of Houston, Texas, is the dentist member already appointed.

The expansion of the Committee to include another dentist follows closely a special A.D.A. committee recommendation to Secretary of Defense Forrestal calling for the appointment of one additional civilian dentist and the dental heads of the Army, Navy and Air Force. No action has been taken on the latter portion of the recommendation.

Mr. Forrestal also was informed by the A.D.A. committee of a House of Delegates' action which urged the formation of a separate five-man dental advisory board to deal with dental manpower problems in the nation's defense program. It now appears that Mr. Forrestal has rejected that idea in favor of enlarging the Medical Advisory Committee.

In addition to the dentist members, the Committee now is composed of one layman and 11 physicians. The layman is Charles Cooper, president of the Board of Directors of New York's Presbyterian Hospital. The physicians are: Edward D. Churchill, Harvard University; Maurice Pincoff, University of Maryland; Howard A. Rusk, New York University; Paul R. Hawley, head of the Blue Cross Plan; R. L. Meiling, American Medical Association; Ray Allen, Seattle; M. A. DeBakey, Baylor University; Paul Titus, Pittsburgh and the medical heads of the Army, Navy and Air Force.

A.D.A. STUDENT MEMBERSHIP TOTAL REACHES RECORD 5,122

Student membership in the A.D.A. has risen to a record 5,122 and reports from dental schools which have not yet sent in their complete returns indicate that last year's enrollment of 3,379 may be doubled. Five per cent of the A.D.A. approved schools have enrolled 100 per cent of their student bodies.

L. M. Cruttenden, assistant secretary of the Association and head of the student member campaign, has pointed out some of the benefits attendant to membership. Of particular interest is a provision whereby student members pay only $3 dues to the A.D.A. during their first year out of school provided they are accepted for active membership in a constituent or component society. Regular dues for the year are $12. Student members also may attend all A.D.A. scientific meetings and they receive THE JOURNAL monthly.

Among those eligible for student membership for the first time are postgraduate students and dental interns who enter their studies directly after graduation. Formerly membership was confined to students in dental school.

A tabulation of student membership to Jan. 14 follows:

Dental Schools	Student Members
Baylor University	252
College of Physicians and Surgeons*	187
Creighton University	57
Emory University	191
Georgetown University	270
Harvard University	1
Howard University	20
Indiana University	150
Loyola University (Chicago)*	318
Loyola University (New Orleans)	49
Marquette University	0
Medical College of Virginia	165
Meharry Medical College	1
New York University	288
Northwestern University	116
Ohio State University	228
St. Louis University	0
State University of Iowa	71
Temple University*	456
Tufts College	1
University of Buffalo	61
University of California	87
University of Detroit*	197
University of Illinois	63
University of Kansas City	336
University of Louisville	0
University of Maryland	184
University of Michigan	63
University of Minnesota	57
University of Nebraska	112
University of Oregon	0
University of Pennsylvania	303
University of Pittsburgh	67
University of Southern California	186
University of Tennessee	26
University of Texas*	193
University of Washington	98
Washington University	122
Western Reserve University	166
TOTAL	5,122

*Schools with 100 per cent of the student body enrolled as student members of the A.D.A.

COUNCIL ON THERAPEUTICS CORRECTS JANUARY REPORT

The Council on Dental Therapeutics wishes to correct an error in its report titled "Present Status of Preparations Used in Impregnation for Caries Prophylaxis" in the January issue of THE JOUR-

NAL (38:147). The word "zinc" should be changed to "potassium" in the third line from the last line of the first column and the first line of the second column. The corrected passages would then read, ". . . a 10 per cent solution of potassium ferrocyanide." and ". . . 20 per cent potassium ferrocyanide . . ."

CHILDREN'S DENTAL HEALTH DAY INTEREST RUNS HIGH

Reports from dental societies around the country indicate widespread interest in the A.D.A.'s first National Children's Dental Health Day to be held Monday, Feb. 7, and the Council on Dental Health still has some special material for use by those who want it.

A packet of 13 educational booklets and leaflets, prepared for distribution in connection with Children's Dental Health Day, is available from the A.D.A. for $1 postpaid.

Latest to report on its plans for conducting a special program for both dentists and laymen is the Akron Dental Society which this year is celebrating the ninth anniversary of Children's Dental Health Week there. A program of preventive dentistry stressing nutrition has been arranged primarily for children, according to H. L. Goldfarb, chairman of the Dental Health Week Committee. The speaker for this program also will address the Society's members in addition to speaking over the local radio station and at a luncheon meeting.

The Society intends to use the A.D.A.'s new dental health education recordings which were prepared by the Southern California Dental Association. They include records made by Bing Crosby, Bob Hope, Cornelle Wilde, Robert Taylor, Amos and Andy, and Tony Martin. The album, including a teaching outline, can be obtained from the A.D.A. for $15. Animated cartoons will be shown in five local theatres while other dental education films are to be shown in the city's schools.

A report from the A.D.A.'s Council on Legislation indicates that an effort will be made to secure a Congressional order for a proclamation from the President setting aside the first Monday in February as National Children's Dental Health Day.

SPECIAL JOURNAL SUPPLEMENT ON HEALTH ISSUES PLANNED

Plans are under way for a special supplement to the April number of THE JOURNAL devoted entirely to the nation's dental health and the issue of compulsory health insurance.

The supplement is being designed to provide a comprehensive, timely discussion of the nation's dental health needs, the A.D.A.'s program to meet those needs and the problem of compulsory health insurance as it relates to public health, the dental profession and the nation's economy. Articles are being prepared by experts both in and out of the dental profession.

How compulsory health insurance schemes are working in other countries will be an important section of the supplement. The system now being used in England will be thoroughly analyzed by both an American observer and British dental authorities.

THE JOURNAL WILL CARRY NEW A.D.A. CONSTITUTION, BYLAWS

Full text of the new A.D.A. Constitution and Bylaws as adopted by the House of Delegates at its meeting last September will be printed in the March issue of THE JOURNAL. A limited number of separately printed copies are available to members on request. Copies have been distributed to Association officials, presidents and secretaries of constituent societies and secretaries of component societies.

DENTAL SOCIETIES

THREE LARGE DENTAL MEETINGS TO BE HELD IN FEBRUARY

The cities of Chicago, Minneapolis and Philadelphia will be hosts this month to three of the nation's largest dental meetings.

The Philadelphia County Dental Society's Greater Philadelphia Annual Meeting will be held at the Bellevue-Stratford Hotel, Feb. 2-4. This will be followed in Chicago by the Chicago Dental Society's Annual Midwinter Meeting, Feb. 7-10. The Minnesota State Dental Association Annual Meeting, which draws attendance from a number of surrounding states, will be held at Minneapolis, Feb. 21-23. Each meeting will feature clinics, essayists and scientific exhibits.

In addition, the annual meeting of the Dental Alumni Society of the University of Pennsylvania will be held Feb. 1 at Philadelphia, while in Chicago the American Association of Endodontists will meet Feb. 5-6.

MASON MEMORIAL CLINIC HELD BY GEORGIA DISTRICT SOCIETY

The third annual R. Holmes Mason Memorial Clinic was held recently in Macon, Ga., by the Central District Society of the Georgia Dental Association under the direction of N. Buford Jones, president. Eight speakers were on the program, including Marjorie Shearon, Washington, D. C., who spoke on the dangers of "police state dentistry."

Other speakers on the program were: George W. Matthews, Birmingham, Ala.; O. B. Coomer, Louisville, Ky.; F. A. Arnold, Jr., Bethesda, Md.; J. M. Hawley, Columbus, Ga.; William A. Garrett, Atlanta, Ga.; Guy H. Wells, Milledgeville, Ga. and Porter Carswell, a humorist.

D.C. DENTAL SOCIETY TO HOLD POSTGRADUATE CLINIC SOON

The District of Columbia Dental Society will hold its annual postgraduate clinic Mar. 13-16 under the chairmanship of John O'Keefe, according to Karl Hayden Wood, secretary-treasurer of the Society. The clinic will be held in the Shoreham Hotel, Washington, D. C.

DENTAL EXCUSAL FORM TO BE USED IN CHICAGO SCHOOLS

Pupils in Chicago public schools henceforth will be authorized officially to keep dental appointments during school hours since School Superintendent Herold C. Hunt has approved an excusal form which was prepared and recommended by the Chicago Dental Society.

The Committee on Dental Health Education of the Society, reporting on the acceptance of the excusal form, warned dentists that the form was not designed for the convenience of the dentists, but intended solely as a means of providing dental care to more children.

Other Society dental health education activities reported by the Committee included a ten-week series of radio programs prepared in cooperation with the Chicago Board of Education, a dental health motion picture program, a dental survey and poster displays.

KENTUCKY DENTAL SOCIETY TO HONOR WM. M. RANDALL

The 89th annual meeting of the Kentucky State Dental Association, to be held April 3-6, at Louisville, will be dedicated to William Marcus Randall, past-president of the Association, according to A. B. Coxwell, secretary-treasurer.

Dr. Randall has been active in local,

state and national dental association activities and has lectured widely on complete denture prosthesis. He held the rank of professor of dentistry for 48 years and served as vice-chairman and chairman of the A.D.A.'s complete denture section.

In addition to serving in a number of posts in the State Dental Association, Dr. Randall was secretary of that organization for 22 years. He is a member of Psi Omega Dental Fraternity, a charter member of Omicron Kappa Epsilon, a fellow of the American College of Dentists and a member of the International Society of Dental Research.

MINNESOTA DENTISTS REACH GOAL IN FOUNDATION DRIVE

A victory dinner was staged recently by the University Relations Committee of the Minnesota State Dental Association to celebrate completion of a campaign to raise funds for the Minnesota Dental Foundation. The Committee conducted the campaign under direction of W. C. Pitzen and D. R. Mackay, both of St. Paul.

Other recent developments in Minnesota dental activities included the televising of the surgical preparation of the oral cavity for insertion of an immediate denture for members of the Minneapolis District Dental Society. The program was held in conjunction with the Society's regular meeting and more than 200 dentists viewed the operation on television screens set up in the hotel ballroom.

Donald A. Wallace, secretary of the A.D.A.'s Council on Dental Therapeutics, talked on sodium fluoride at the December meeting of the St. Paul District Dental Society.

FIRST DISTRICT SOCIETY OF NEW YORK INSTALLS OFFICERS

Francis X. McHugh was installed recently as president of the First District Dental Society of the State of New York at the Society's annual meeting. He succeeds Sidney E. Riesner.

Other officers elected to take office with Dr. McHugh are: Oscar Jacobson, president-elect; Arthur E. Corby, vice-president; Percy T. Phillips, secretary and Louis I. Abelson, treasurer. Drs. Phillips and Abelson will continue in office from previous terms.

The annual meeting also featured a talk on the problems of medicine and dentistry as they relate to the changing social and political order by Howard Reid Craig, director of the New York Academy of Medicine.

DENTAL EDUCATION

C. D. MARSHALL-DAY IS NAMED TUFTS DENTAL DEAN

Cyril D. Marshall-Day, of Rochester, N. Y., has been appointed dean of Tufts College dental school to succeed Joseph Volker who has become dental dean at the University of Alabama. Dr. Marshall-Day's appointment became effective on Jan. 31.

An authority on the relation of dietary deficiencies to dental effects, Dr. Marshall-Day recently was director of research in the Eastman Dental Dispensary and professor of clinical dentistry in the University of Rochester's school of medicine and dentistry. Earlier he was dean of dentistry at the University of Punjab, Lahore, India.

Dr. Marshall-Day is a New Zealander and received his first degree in dentistry from Otago University. He also has taken the D.M.D. degree from Harvard University, the M.S. degree from Rochester

University and has a doctorate in physiology from the University of Punjab.

Another postgraduate course which will begin on Mar. 23 will deal with oral surgery and the temporomandibular articulation. Bernard G. Sarnat, head of the department of oral and maxillofacial surgery will be in charge of the course. Further information may be secured by writing Dr. Sarnat, University of Illinois college of dentistry, 808 S. Wood St., Chicago 12.

STUDENTS ORGANIZE DENTAL SOCIETY AT U. OF TENNESSEE

Formation of the Honorary Odontological Society, an organization for dental students, was announced recently by the University of Tennessee college of dentistry coincident with the presentation of symbolic keys to Richard D. Dean and his wife Marguerite, honoring them for their work in dentistry. Dr. Dean has been dean of the University's dental school since 1942.

The Society is expected to have a membership of about 10 per cent of the entire dental school enrollment of 350 and election to the Society will be on scholastic merit.

PERIODONTIA TO BE SUBJECT OF U. OF ILLINOIS COURSE

In addition to a previously announced postgraduate course on recent advances in caries control, the University of Illinois college of dentistry will hold a postgraduate course Feb. 11-12 on advanced periodontia and the histopathology of the gingiva. Both courses are being given immediately following the Chicago Dental Society's midwinter meeting.

The periodontia course will be conducted by Balint Orban, of the dental college, and his staff. It will be presented as a combination of lecture and laboratory studies of the normal and abnormal gingiva including studies of changes in acute, chronic and ulcerative gingivitis, and in the gingiva of patients suffering from systemic diseases such as vitamin deficiency, diabetes, and leukemia. Enrollment in the course is limited but is open to both veterans and non-veterans. Registration may be made by writing Isaac Schour, University of Illinois college of dentistry, 1853 West Polk St., Chicago 12.

The course on recent advances in caries control, under direction of Robert G. Kesel, professor and head of the department of applied materia medica and therapeutics, will be presented by seven dental authorities. The usefulness of caries activity tests will be discussed and several practical methods for determining caries activity will be described.

DENTAL SCHOOL LISTS NAMES OF POSTGRADUATE ALUMNI

A directory of dentists who have participated in one or more of the refresher courses in dentistry for children offered each year since June, 1941, by the College of Physicians and Surgeons school of dentistry, San Francisco, has been completed, according to Charles A. Sweet, director of postgraduate education.

Names appearing in the directory are largely those of California dentists. Other states represented are: Arizona, Colorado, Illinois, Missouri, Montana, Nevada, Oregon, Texas, Utah, Washington and Wyoming. The names of several dentists practicing in Hawaii and Nicaragua also are included.

OHIO STATE U. TO OFFER NINE POSTGRADUATE COURSES

Nine postgraduate courses will be offered during the spring quarter by The Ohio State University college of dentistry, according to Hamilton B. G. Robinson, director of the postgraduate division.

The first of the five-day courses will begin on March 28 and the last will end June 17. Subjects to be presented in the courses which are limited to an enrollment of ten are: periodontia, oral pathology, oral surgery, partial dentures, children's dentistry, full dentures, crown and bridge, roentgenology, and the anatomy of the head and neck. All the courses are available under the G.I. Bill of Rights for veterans. Further information may be obtained by writing Dr. Robinson, Ohio State University college of dentistry, postgraduate division, Columbus 10, Ohio

TWENTY REFRESHER COURSES LISTED BY TUFTS COLLEGE

Tufts College dental school will present 20 postgraduate refresher courses in the first half of 1949, according to Arthur H. Wuehrmann, acting director of the division of graduate and postgraduate studies.

The courses, ranging from one day a week for six weeks to a full two weeks in time, cover such subjects as applied anatomy of the head and neck; crown and bridge prosthesis; children's dentistry; full denture prosthesis, general anesthesia in exodontia; minor oral surgery; oral diagnosis and treatment planning; periodontology; physiology of mastication; roentgenographic technic and interpretation and prevention, and control of oral disease. For further information write Dr. Wuehrmann, Tufts College dental school, 416 Huntington Ave., Boston 15.

RESEARCH

NATIONAL ADVISORY DENTAL RESEARCH COUNCIL MEETS

The first meeting of the National Advisory Dental Research Council, held Jan. 10, in Washington, D. C., resulted in the election of Leonard A. Scheele, surgeon general of the U. S. Public Health Service, as acting chairman. Those attending the meeting termed it largely organizational in nature.

H. Trendley Dean, director of the new National Institute of Dental Research, told the group that all Public Health Service dental research projects have been placed under his direction at the Institute. Council members also reviewed a number of applications for federal grants to support various dental research projects.

The new Institute presently is operating on funds allocated by the Public Health Service since Congress authorized but did not appropriate the $2,750,000 for construction of a new dental research building and for operating funds. Whether the funds will be appropriated by this Congress remains to be seen since they were not included in President Truman's recent budget message.

TWO CARIES INVESTIGATIONS UNDER WAY IN NEW ZEALAND

An investigation of carbohydrate reduction in the diet as a possible method of preventing caries has been undertaken by the New Zealand School Dental Service. The Service also is continuing studies to determine the advisability of using the topical application of sodium fluoride.

The dietary study is being made among a group of student dental nurses and is designed to determine whether immunity from caries can be produced by a reduction of carbohydrate for a given period.

COMPLETE NATIONAL HEALTH INSTITUTE REALIGNMENT

An extensive realignment of the medical research program at the National Institutes of Health, Bethesda, Md., was completed recently when establishment of a Microbiological Institute was approved by the Federal Security Admin-

istration, according to Assistant Surgeon General R. E. Dyer, of the U. S. Public Health Service, director of the National Institutes of Health.

This new agency brings to three the number of institutes recently created. The other two are the National Institute of Dental Research and the National Heart Institute.

FEDERAL GRANTS FOR CANCER STUDY GIVEN DENTAL SCHOOLS

Grants totaling $810,856 for cancer control projects and cancer teaching in medical and dental schools were announced recently by the Federal Security Agency. Dental school grants totaled $44,914.

Dental schools receiving grants for continuation of training programs and the amounts are: Loyola University (New Orleans), $5,000; Harvard University, $5,000; Tufts College, $5,000; Columbia University, $4,968; New York University, $5,000; Ohio State University, $5,000; Temple University, $5,000; University of Pittsburgh, $5,000 and University of Tennessee, $4,496. Washington University school of dentistry received a grant of $7,684 to conduct a histologic study to determine whether tumors can be produced experimentally in the mouth and lips of animals.

ARMY AND NAVY

NAVY DENTAL OFFICERS TO APPEAR FOR CERTIFICATION

Commander Alvin H. Grunewald and Lt. Commander Harry E. Denen, of the U.S. Naval Dental School, have been authorized to appear before the American Board of Prosthodontia for certification, a report from the Bureau of Medicine and Surgery states. The Board will meet during the Chicago Dental Society's midwinter meeting this month.

The report also disclosed that cold weather dental problems are being investigated by Commander Samuel Goldhaber and Lt. Commander George B. Crossmire who have accompanied ice breakers into arctic waters.

NEW PERSONNEL POLICY BOARD CREATED IN FORRESTAL OFFICE

Organization of a Personnel Policy Board for the entire National Military Establishment under direction of Thomas R. Reid, vice-president in charge of human relations for McCormick and Company, Baltimore, is under way. Brig. Gen. Charles T. Lanham, special assistant to Gen. Omar N. Bradley, Army chief of staff, will be director of staff under Mr. Reid.

The new Board will be a staff agency of the Office of the Secretary of Defense, according to a report from Secretary James E. Forrestal. It will function in the field of civilian and military personnel policies.

Composition of the Board will include representatives from the three military departments. The Board's establishment was recommended by both the Committee on National Security Organization of the "Hoover Commission" and the Secretary of Defense's Commission on Service Pay. Remaining appointments to the Board have not yet been made.

STANDARDIZED NOMENCLATURE APPROVED BY ARMED FORCES

A standardized "diagnostic nomenclature of diseases and injuries" text for common use by the medical services of the armed forces has been approved by the Surgeons General of the Army and Navy, and by the Air Surgeon.

The guide, authorized by Secretary of Defense James E. Forrestal last June, has been completed and is to be used in the three military departments soon. Use of common terminology by the medical services is expected to facilitate medical statistical and clinical research in addition to simplifying the treatment of patients from one service who are treated in the medical facilities of another.

The nomenclature in the new uniform guide is based on the American Medical Association's standard nomenclature of disease and the new International Statistical Classification of Diseases, Injuries and Causes of Death.

VETERANS

RADIOISOTOPE UNIT TO BE FORMED AT V.A. HOSPITAL

A radioisotope unit for the Veterans Administration hospital at Nashville, Tenn., has been authorized by the V.A. in an effort to bring the benefits of atomic medicine to patients there. Radioisotopes to be used initially are radiophosphorous, radiosodium, radioiron, and radioiodine. A program of special research also is being planned. This is the eleventh such unit established by V.A.

V.A. WARNS BRANCHES NOT TO EXPAND DENTAL CLINICS

A marked reduction in the blacklog of pending dental cases among veterans recently prompted the Veterans Administration to warn its branch offices that "the work load has become stabilized to the extent that any expansion of Veterans Administration dental clinics should not be undertaken."

The V.A. directive qualified its restriction of new dental activities to those areas in which the number of participating dentists is sufficiently large to assure dental service on a fee basis. A further reduction in the blacklog "will, of necessity, be justification for closing of these smaller clinics and surplusing of excess dental personnel," it was stated.

This V.A. action follows a statement made last fall to the A.D.A. by government representatives outlining plans for curtailment of dental clinics.

PRIVATE PHYSICIANS RECEIVE OVER $11 MILLION FROM V.A.

Of a total of 1,626,169 veterans treated under the Veterans Administration "home town" medical program, 761,165 were treated by private physicians during the year ended June 30, 1948, a recent V.A. report discloses. They were paid $11,437,739 for a total of 2,735,429 treatments, establishing an average treatment charge of $4.18. The average number of treatments per patient was three.

INTERNATIONAL

INTERNATIONAL FEDERATION OF DENTISTS TO MEET IN ITALY

The next annual meeting of the Fédération Dentaire Internationale will be held May 30 to June 5 at Milan, Italy, according to M. F. Watry, of Brussels, Belgium, general secretary.

An invitation to hold the meeting in Milan was presented by the Italian National Committee when the Norwegian National Committee reported that it could not accept the spring date. The Committee originally desired to have the

Federation's meeting coincide with a Scandinavian professional reunion. For additional information, write Dr. Watry at 35 Rue Souveraine, Brussels.

BRITISH DENTAL INSTITUTE APPEALS TO U.S. FOR BOOKS

An appeal for back issues, preferably bound volumes, of the dental and stomatological literature written in the United States has been made by the Institute of Dental Surgery, Eastman Dental Clinic, London, England. W. G. Cross is the librarian.

A.D.A. MEMBERS INVITED TO INDIA DENTAL CONFERENCE

An invitation to all members of the A.D.A. to attend the fourth All India Dental Conference, to be held in Calcutta, Feb. 18-20, has been extended by S. P. Neogi, organizing secretary of the Conference. Dentists from all parts of the world are expected at the meeting, he said.

GENERAL NEWS

GENERAL ANESTHESIA GROUP TO DISCUSS DENTAL ASPECTS

The Spring meeting of the American Society for the Advancement of General Anesthesia in Dentistry will be held Mar. 28, at the Midston House, New York, according to M. Hillel Feldman, executive secretary.

The program will include a pre-meeting dinner. Alvan L. Barach, professor of medicine at Columbia University medical school will speak on anoxia in anesthesia and Seymour Schotz, director of the department of anesthesia, Presbyterian Hospital, Philadelphia, will talk on a program for training the dental anesthetist.

TESTIMONIAL SEMINAR FOR OREN A. OLIVER TO BE HELD

A testimonial seminar in orthodontics, a luncheon and a banquet will be held Mar. 12, in the Mayflower Hotel, Washington, D. C., in honor of Oren A. Oliver, of Nashville, Tenn., past-president of the A.D.A. and the American Association of Orthodontics.

A group of dentists headed by Walter T. McFall, of Asheville, N. C., has planned the testimonial and Leigh C. Fairbank, of Washington, D. C., is in charge of reservations. Two hundred hotel rooms are reserved for the occasion.

Dr. Oliver has served dentistry for 40 years and has been active in dental education, public health and particularly orthodontics. He is a graduate of Emory University school of dentistry, Atlanta, Ga.

Members of the testimonial committee in addition to Drs. McFall and Fairbank are: E. C. Lunsford, Miami, Fla.; Frank P. Bowyer, Knoxville, Tenn. and Boyd W. Tarpley, Birmingham, Ala. For additional information write Dr. Fairbank at 1726 Eye St., N.W., Washington, D. C.

ACADEMY OF ORAL PATHOLOGY SETS DATE; OUTLINES PROGRAM

The third annual meeting of the American Academy of Oral Pathology will be held Feb. 6, at the Stevens Hotel, Chicago, according to Secretary-treasurer Joseph L. Bernier. Presentation of papers and discussions will begin at 9 a.m.

A banquet featuring Robert A. Moore, medical school dean and professor of pathology, Washington University, St. Louis, will be held in the evening.

The morning program calls for Barnet M. Levy, of Washington University school of dentistry, to speak on experimental production of jaw tumors in animals; Paul E. Boyle, of the University of Pennsylvania school of dentistry, to

speak on periodontal disease in albino rats fed diets deficient in vitamin A; Reed O. Dingman, University of Michigan school of dentistry and new editor of the *Journal of Oral Surgery,* to speak on ameloblastoma; Paul C. Kitchen, of Ohio State University school of dentistry, to speak on dens in dente and Henry A. Swanson, chairman, Council on Dental Museum and Registry of the A.D.A., to speak on the development of oral pathology as a specialty in dentistry.

The afternoon session will be devoted to papers by Paul Montgomery, Ohio State University school of dentistry, speaking on a preliminary report on the use of the papanicolaou technic in the oral cavity; Granville A. Bennett, Univeristy of Illinois college of medicine, speaking on diagnoses in certain neoplasms arising in skeletal tissues; Isaac Schour, University of Illinois college of dentistry, speaking on the interdependence of the tissues in odontogenesis; Joseph L. Bernier, Army Institute of Pathology, speaking on evaluation of fibrous tissue tumors arising in the periodontal membrane; Stanley A. Lovestedt, the Mayo Clinic, speaking on the dental aspects of spontaneous parathyroid insufficiency and Irving Glickman, Tufts College dental school, whose subject has not yet been announced.

DENTAL SCHOOL TEACHERS NOT AUTOMATICALLY DRAFT EXEMPT

Although provision for deferment of predental and dental students from the present military draft has been made, dental school faculty members under the present 26 year-old age limit are not eligible automatically for deferment.

The status of dental school teachers was brought to light in an exchange of letters between Gerald D. Timmons, dean of Temple University school of dentistry, and Selective Service. What, if any, changes will be made in the present regulations if a more comprehensive draft bill is passed by Congress is not now known.

Col. Joel D. Griffing, chief of Selective Service's manpower division, stated in a reply to Dr. Timmons' inquiry: "Under the selective service act of 1948, the responsibility for all classification is placed in local boards. There is ample provision under the Act for the classification in an occupational classification of those determined by the local board to be engaged in an activity in study, research, or medical, scientific, or other endeavors found to be necessary to the maintenance of the national health, safety, or interest. No person within such category shall be deferred except upon the basis of his individual status.

"The registrant who is engaged in dental teaching and the school which employs him have the right to petition the local board for an occupational classification."

ILLINOIS CHAPTER OF ALPHA OMEGA FRATERNITY TO MEET

The Illinois alumni chapter of Alpha Omega Fraternity will hold its annual midwinter dinner at the Congress Hotel, Chicago, Feb. 6. Ira L. Gold, 3742 Irving Park Blvd., Chicago, is in charge of reservations.

OVER 250 DENTAL ASSISTANTS CERTIFIED BY NATIONAL BOARD

More than 250 dental assistants have been certified by the National Dental Assistants Association under the organization's recently formed national certification board.

Examinations consisting of a written test and practical demonstration are required of candidates for certification and each candidate must have completed a 104-hour study course to qualify.

REPORTS OF COUNCILS

BUREAU OF PUBLIC INFORMATION

COSMOPOLITAN MAGAZINE ATTEMPTS TO SMEAR THE DENTAL PROFESSION

THE January issue of *Cosmopolitan* magazine contained an attack upon the dental profession entitled, "What Should Your Dentist Charge?" The article was of the usual smear type of the self-appointed crusader. The following letter was sent to Mr. Herbert R. Mayes, supervising editor of the magazine, by the Bureau following publication of the article:

The article in your January issue entitled, "What Should Your Dentist Charge?" is grossly unfair to the distinguished profession of dentistry. It is surprising that a magazine of the standing of Cosmopolitan would publish such an article.

On the basis of a rather limited survey, the author, McLeod Morgan, comes to the glib conclusion that all dentists should make identical diagnoses and have roughly the same fee schedules. Mr. Morgan admits the weakness of his conclusions by his own defensive protests in the concluding paragraphs.

Every person, including dentists, must rely on his own judgment. There are differences of opinion in all fields of human endeavor, particularly in the highly complex health sciences. I cannot conceive that even Mr. Morgan believes that the acme of scientific knowledge has been achieved by man. It is to be expected that there should be variation in diagnosis and treatment planning by individual dentists just as there would be by physicians; just as there would be by any individual attempting to solve a problem whether he be a lawyer, an engineer or an editor. Different dentists use different methods in making examinations. It is granted that some are more thorough than others and that there will be different findings. This merely proves that individuals should have the right to select the dentist in whom they have confidence. It does not suggest that this free choice of practitioner should be eliminated.

It might be that such a "millennium" as envisioned by Mr. Morgan regarding fees could be achieved under a tightly regimented form of state medicine through which all physicians and dentists would work for the government. This may be the opinion of some individuals. It is not the opinion of competent dental authorities who have made more than a superficial study of the problem. Until that "millennium" of regimented government control of the health professions is forced upon the professions and the public, there will be variations in fees in different types of practice and in different areas. The patient will continue to have the right to choose the practitioner whose fees are acceptable to him. And the practitioner will have the right to charge fees which he believes compensate him for his services.

The record of the dental profession in the United States is one of outstanding health service to the American people. Nowhere in the world is the level of dental health as high as it is in the United States. Inadequacies exist in all fields of human endeavor. Dentistry has corrected many of its shortcomings in the past and will correct others in the future through education and self-discipline. The dental profession, however, has no intention of yielding the advances made under the system of private practice to Mr. Morgan's implied solution—the establishment of a system of regimented control of the nation's health services.

The January 8 issue of *Collier's* magazine contained an article recommending the impregnation process developed by Dr. Bernhard Gottlieb for general use as a caries control measure. In answer to this, the Bureau issued the following statement to the press:

Recently published reports of an impregnation method of preventing dental decay developed by Dr. Bernhard Gottlieb of Baylor University (Dallas, Texas) today were described as "premature" by staff scientists of the American Dental Association.

An article in the current issue (Jan. 8, 1949) of Collier's magazine, described the treatment as "something which has been perfected and proved in the last few months."

It consists of treating the teeth with a variety of chemicals to wall off the tiny fissures in the enamel of the teeth which Dr. Gottlieb contends are the invasion roads for decay producing bacteria.

Staff scientists of the Association said that there is inadequate clinical evidence either to prove or disprove the claims of Dr. Gottlieb. They warned that until this supporting evidence is substantial there is danger of encouraging false hope in the minds of the 90 per cent of the nation's population subject to tooth decay.

They pointed out that they had no desire to discourage any research work but said that they questioned the wisdom of recommending treatments for the general public until such treatments are proved to be scientifically sound. Their statement continued:

"Future research will either substantiate or disprove Dr. Gottlieb's theory and the claims that he makes for the effectiveness of his treatment. But it is unfortunate that premature publicity has been given to a treatment for which so little scientific evidence is available.

"It is not prudent to make the claims that were made in the Collier's magazine article when they are supported only by clinical studies of 58 children and 12 others as a control group in one instance and 42 children in another experiment.

"Dr. Gottlieb presents a hypothesis about the etiology of dental caries different from that accepted by nearly all dental histologists and pathologists. He has that right but others also have the right to question it."

COUNCIL ON DENTAL EDUCATION

THE FIFTH CONGRESS ON DENTAL EDUCATION AND LICENSURE TO BE HELD IN FEBRUARY

The first Congress on Dental Education and Licensure was conducted by the Council on Dental Education on February 15, 1941. Since then, three other congresses have been held, and the fifth will be held on February 5, 1949 at the Stevens Hotel in Chicago just prior to the Chicago midwinter meeting.

The attendance at these sessions has always been gratifying, for at each there have been representatives from nearly every dental school and from most of the state boards of dental examiners. The meetings have included formal papers, panel discussions and informal debate, and all have dealt with the problems and topics in which the examiners and the representatives of the schools have mutual interests.

The purpose of these congresses is to assist in a better understanding of the functions of both the schools and the

boards in the education and licensure of the dentist. Through these meetings, the teachers can be kept better informed on the work of the boards and the ways in which the work of both may be more closely integrated. Likewise, the boards can be kept better apprised of the educational methods that are being employed in the various schools.

The program that has been arranged this year deals with the methods of teaching used in the schools and the methods of examining that are being employed both in the schools and by the boards. William N. Hodgkin, a member of the Council and an examiner of the Virginia board, is chairman of the Council's committee. The other members on the committee are Charles W. Freeman, T. M. Barlow, J. Roy Blayney and Shailer Peterson. The program of the Congress follows.

CONGRESS ON DENTAL EDUCATION AND LICENSURE

North Ballroom, Stevens Hotel, Chicago

Saturday, February 5, 1949

Morning Session, 9:15 o'clock

METHODS OF TEACHING AND EXAMINING IN THE BASIC SCIENCES

Chairman: Charles W. Freeman, dean, Dental School of Northwestern University, Chicago

Papers: *The Methods Employed in Teaching the Basic Sciences:* Linden F. Edwards, College of Dentistry of The Ohio State University, Columbus

The Methods Employed in Examining the Achievement of Students in the Basic Sciences: Gustav W. Rapp, Loyola University School of Dentistry, Chicago College of Dental Surgery, Chicago

The Methods Employed in Examining Dental School Graduates in Their Knowledge of the Basic Sciences: Philip L. Schwartz, member of the New Jersey Board of Dental Examiners, New Brunswick

General Discussion

Afternoon Session, 2:00 o'clock

METHODS OF TEACHING AND EXAMINING IN THE CLINICAL SUBJECTS

Chairman: William N. Hodgkin, member of the Council on Dental Education and member of the Virginia Board of Dental Examiners, Warrenton

Papers: *The Methods Employed in Teaching the Clinical Subjects:* Harry B. McCarthy, Baltimore College of Dental Surgery of the University of Maryland, Baltimore

The Methods Employed in Examining the Achievement of Students in the Clinical Subjects: William J. Simon, School of Dentistry of the University of Minnesota, Minneapolis

The Methods Employed in Examining Dental School Graduates in Their Knowledge of the Clinical Subjects: David J. Fitzgibbon, member of the District of Columbia Board of Dental Examiners, Washington, D. C.

General discussion

Conducted under the auspices of the Council on Dental Education of the American Dental Association

J. Roy Blayney, chairman of the Council on Dental Education, presiding

COUNCIL ON DENTAL THERAPEUTICS

PRELIMINARY COMMENTS ON DENTAL PRODUCTS

In order to provide helpful information promptly, the Council on Dental Therapeutics has authorized the publication of preliminary comments concerning commercial preparations which are within its scope. The comments are limited to clear-cut facts and references to previously published information and written opinions. The Council will authorize the publication of comprehensive status reports at a future time if they appear to be needed and will accept those products which, on investigation, are found to be eligible for inclusion in *Accepted Dental Remedies* in accordance with its rules.

The products listed below have not been accepted by the Council.

Mandresen is a trade name applied to a tooth powder said to be made according to the formula of Andresen.[1] The tooth powder contains tartaric acid and carbonates which react, when they are mixed with water, to liberate carbon dioxide. Therefore the preparation is referred to as an effervescent dentifrice.

The advertising claims that Mandresen has proved very satisfactory for remineralizing soft teeth, relieving sensitivity, controlling decalcification due to erosion or dental caries, and as an effective prophylactic against dental caries. The Council on Dental Therapeutics has examined the available evidence[2, 3] and has not discovered demonstrated therapeutic value in Andresen's formula.

Topithesia, a topical anesthetic, is stated on the label to contain ethyl aminobenzoate (benzocaine), cinnamon oil, camphor, menthol and alcohol. While the label says that Topithesia contains alcohol, the percentage is not given as required by law. A folder (12475M) states that isopropanol is employed as a solvent.

The folder claims synergistic action and freedom from irritating qualities. These characteristics are not supported by evidence, so far as the Council is aware. The quantitative composition of Topithesia is not known. The Council has asked the firm to provide a quantitative statement of composition for its product and to cite evidence in support of the claims made for it, but the firm has not supplied adequate information.

Stuart Therapeutic B Complex, C is marketed in large tablets, each stated to contain ascorbic acid, 150 mg.; nicotinamide, 150 mg.; thiamine hydrochloride, 20 mg.; riboflavin, 10 mg.; pyridoxine hydrochloride, 5 mg., and calcium pantothenate, 10 mg. The product is also stated to contain liver extract, from which some of the aforementioned vitamins are derived.

Each tablet would provide twice the amount of ascorbic acid, 10 times the amount of nicotinamide, 13 times the amount of thiamine hydrochloride, and 5 times the amount of riboflavin recommended as the total daily dietary allowance for a moderately active 154-pound

1. Bodecker, C. G., Dental Erosion, Its Possible Causes and Treatment. *D. Cosmos* 75:1056 (Nov.) 1933.
2. Eff-Remin Dentifrice—Not Acceptable for A.D.R. *J.A.D.A.* 26:1887 (Nov.) 1939.
3. Council Finds Calcifo Dentifrice Not Acceptable for Inclusion in "Accepted Dental Remedies." *J.A.D.A.* 34:567 (April 15) 1947.

man by the Food and Nutrition Board of the National Research Council.[4] The requirements for pyridoxine hydrochloride and calcium pantothenate in human nutrition have not been established.

Panodynes are claimed to be useful as an antipyretic, as an analgesic and sedative preoperatively and postoperatively, and in the temporary relief of toothache. Each tablet is stated to contain acetylsalicylic acid, 4 grains (0.25 Gm.); acetophenetidin, 1 grain (60 mg.); caffeine, ¼ grain (15 mg.), and powdered extract of gelsemium N.F. VII, 1/10 grain (6 mg.).

The proportion of acetylsalicylic acid is relatively large, and the proportion of acetophenetidin is relatively small, as compared with amounts present in many other mixtures of this general character. Powdered extract of gelsemium was official in the seventh (1942) edition of *The National Formulary*. The official dose was 1/6 grain (10 mg.).

Gelsemium is the root of yellow jasmine, which contains several alkaloids. For a brief discussion of actions, uses and toxic effects, the reader may wish to refer to a text by Sollmann.[5]

In selecting analgesic and sedative medication, it is well to consider that tablets such as Panodynes are more potent than the commonly used 0.3 Gm. (5 grain) tablets of acetylsalicylic acid and that toxic side-effects generally increase with potency. The effects of mixtures are also more difficult to predict. The Council on Dental Therapeutics has encouraged the use of single drugs, rather than mixtures, for routine preoperative and postoperative medication. The composition of Panodynes is unnecessarily complex.

4. *A.D.R.*, ed. 14, p. 151.

5. Sollmann, T., *A Manual of Pharmacology*, ed. 7. Philadelphia: W. B. Saunders Company, 1948, p. 353.

FEDERAL TRADE COMMISSION

ISSUES ORDER ON AGAROL

William R. Warner & Co., Inc., 113 West Eighteenth Street, New York, has been ordered by the Federal Trade Commission to stop representing that its medicinal preparation, "Agarol," contains agar-agar or any derivative of that substance in sufficient quantity to produce an independent laxative action. In addition, the order requires the corporation to discontinue use of the term "Agarol" as a brand or trade name for the product.

Use of the trade-mark "Agarol" and the word "agar-agar" in advertisements disseminated by the corporation has had the capacity to lead the public to believe that the preparation contains agar-agar in sufficient quantities to produce an independent laxative effect, according to the findings. Contrary to these representations, the Commission found, the preparation, although a laxative, contains no agar-agar. Consequently, the Commission said, no beneficial therapeutic effects can be attributed to the product by reason of any agar-agar content. The Commission noted that the product is composed partly of agar gel—a derivative of agar-agar—but said that this ingredient does not produce an independent laxative action.

The Commission's complaint charged also that the corporation's advertisements were false because they failed to reveal that Agarol is potentially dangerous when taken by persons suffering from appendicitis symptoms and that frequent or continued use of the preparation may result in dependence on laxatives.

The Commission said, however, it is unable to find that "the potential danger in the use of the preparation is serious or that its frequent or continued use may result in an impairment of the public health." Accordingly, it ruled that no disclosure of those facts should be required in the corporation's advertising.

With all the Commissioners concurring, the order was issued on the basis of a stipulation as to the facts entered into between the respondent and counsel for the Commission, in which the respondent waived all intervening procedure and further hearing.

Order 4770
September 3, 1948

COUNCIL FINDS WARD'S CAUSTIC PASTE NOT ACCEPTABLE

THE label for Ward's Caustic Paste lists sodium hydroxide and calcium oxide as ingredients. A sample analyzed in the American Dental Association Bureau of Chemistry was found to contain sodium hydroxide, 41.5 per cent; calcium hydroxide, 23.3 per cent; water, 33.8 per cent, and a small amount of carbonate. Printed matter issued in conjunction with the product recommends its use for removal of superfluous soft tissue anywhere about the teeth.

So far as the Council is aware, there is no controlled clinical evidence to justify the use of chemicals for removal of superfluous tissue in preference to the use of conventional surgical methods. The latter are precise and can be readily controlled by the operator with minimal hazard to the patient. If it is desired to remove superfluous tissue with chemical agents, self-limiting drugs such as liquefied phenol are available for this purpose. Sodium and calcium hydroxides are not self-limiting in their action.

The dangers accompanying the use of concentrated mixtures of sodium hydroxide and calcium hydroxide for the removal of superfluous soft tissue are unnecessarily great. There is no adequate justification for their use in dentistry in preference to other readily available and superior agents and procedures. Ward's Caustic Paste is therefore not acceptable to the Council on Dental Therapeutics.

COUNCIL ISSUES STATUS REPORT ON DENTA-FLUR

DENTA-FLUR, distributed by the Magnusson Company of Bellflower, California, is a bone meal and vitamin D product suggested for use in the control of dental caries, the therapy of adverse gingival conditions, the supplementation of prenatal diets, the desensitization of hypersensitive teeth, the adjunctive treatment of parodontoclasia (sic), and the rectification of poor calcification as evi-

denced by loose teeth and skeletal porosity.

The product is marketed in 7-grain tablets, standardized by addition of calcium fluoride to yield 1.62 mg. fluorine per three tablets. This is the dose recommended for daily administration on the basis that it corresponds in fluorine intake to that received, on the average, in public water supplies containing 1.0 part per million of fluorine, the concentration which has been suggested for caries limitation. The dose contains also 1,200 U.S.P. units of vitamin D to aid in assimilation of calcium.

Acceptable evidence that Denta-Flur is effective in any of the therapeutic roles for which it has been suggested by the distributor does not exist. The significance of the observations of Harootian,[1] Martin,[2] Strean and Beaudet,[3] and Hershman and McHatton[4] cited in its behalf is minimized by the small number of subjects studied, the inadequate duration of observations and lack of adequate control.

The fluorides in the product are relatively insoluble and may not be utilized in the body to any significant extent. The addition of vitamin D is essentially presumptive. A discussion of the class of products of which Denta-Flur is one is available in a previous report of the Council.[5]

1. Harootian, S. G., The Influence of Administration of Bone Flour on Dental Caries. *J.A.D.A.* 30:1396 (Sept. 1) 1943.
2. Martin, E. M., Report on Clinical Use of Bone Meal. *Canad. M. A. J.* 50:562 (June) 1944.
3. Strean, L. P., and Beaudet, J. P., Inhibition of Dental Caries by Ingestion of Fluoride-Vitamin Tablets. *New York State J. Med.* 45:2183 (Oct. 15) 1948.
4. Hershman, E., and McHatton, G., unpublished data.
5. Council on Dental Therapeutics, Bone Meal Preparations Not Acceptable to the Council. *J.A.D.A.* 34:214 (Feb. 1) 1947.

COUNCIL ADOPTS SPECIFICATION FOR LOCAL ANESTHETIC SOLUTIONS FOR INJECTION

This specification, which was prepared by the American Dental Association Bureau of Chemistry, applies to local anesthetic solutions accepted by the Council on Dental Therapeutics. Accepted preparations now include solutions of procaine hydrochloride and of monocaine hydrochloride. If solutions of other anesthetic agents are added to the accepted list, this specification may be changed or extended in order to cover such preparations. Additional changes may be made in accordance with any new evidence that may justify such revision.

It is intended that this specification shall be concerned with those factors which may affect the safety or usefulness of the products as customarily employed by the dentist.

Some of the points covered are included in official regulations which are enforced by governmental agencies. For reasons of convenience and completeness, it seems desirable to include both official and nonofficial requirements in one list. In most instances the references to official requirements are clearly indicated.

The manufacturers of accepted local

anesthetic solutions were given an opportunity to comment on preliminary drafts of the specification. The indicated methods of examination are procedures currently employed in the American Dental Association Bureau of Chemistry. They are included as a matter of information.

Specification

A. General Requirements

A-1. Each product shall conform to the applicable government regulations.

A-2. Each package shall bear a number or other designation which will serve to identify the lot or batch from which the contents were packed. (United States Pharmacopeia XIII, p. 666; National Formulary VIII, p. 689.)

B. Solutions in Dental Cartridges (Tubes with puncturable closures).

B-1. The container shall show no evidence of leakage or other defects.

B-2. The puncturable diaphragm shall be accurately centered in the tube.

B-3. When the tube is properly inserted in a cartridge syringe with attached needle, the amount of force required to move the plunger shall be substantially uniform during the displacement of the plunger throughout the length of the tube.

B-4. The volume of air in any tube shall not exceed 0.03 cc.

B-5. The tubes shall contain not less than 100 per cent and not more than 115 per cent of the labeled volume of solution.

B-6. The anesthetic solution shall be colorless.

B-7. The product shall meet official requirements for Clarity of Parenteral Solutions (U.S.P. XIII, pp. 628 and 666; N.F. VIII, p. 694).

B-8. The pH of the solution shall be not lower than 3.3 and not higher than 5.5.

B-9. Not more than 2.8 cc. of tenth-normal sodium hydroxide shall be required to titrate 20 cc. of the anesthetic solution to pH 7.2.

B-10. The solution shall contain not less than 95 per cent and not more than 105 per cent of the labeled amount of the anesthetic agent.

B-11. When a vasoconstrictor is present, the solution shall contain not less than 95 per cent and not more than 110 per cent of the labeled amount of vasoconstrictor.

B-12. The solution shall meet the requirements of the Total Solids Test of the A.D.A. Bureau of Chemistry.

B-13. The solution shall meet the requirements of the A.D.A. Bureau of Chemistry test for Residue Upon Ignition.

B-14. The solution shall be sterile. (U.S.P. XIII, p. 689; N.F. VIII, p. 746.)

C. Solutions in All-Glass Ampuls.

C-1. The volume of the solution in the ampuls shall meet official requirements for Volume of Injection in Containers. (U.S.P. XIII, p. 665; N.F. VIII, p. 688.) Items B-1, B-6, B-7, B-8, B-9, B-10, B-11, B-12, B-13, and B-14 shall apply also to local anesthetic solutions in ampuls.

D. Solutions in Bottles with Puncturable Diaphragm Closures (Multiple dose containers).

D-1. The volume of the solution in the bottles shall meet official requirements for Volume of Injection in Containers. (U.S.P. XIII, p. 665; N.F. VIII, p. 688.) Items B-1, B-6, B-7, B-8, B-9, B-10, B-11, B-12, B-13, and B-14 shall apply also to bottles of local anesthetic solutions for injection.

Explanatory Notes

A-1. In addition to the provisions of the Federal Food, Drug and Cosmetic Act, other regulations of states, municipalities, etc. may pertain to the manufacture and sale of these products.

B-2. "Puncturable diaphragm" refers only to that portion of the closure which may be penetrated by the inner point of the syringe needle. In order to insure that the needle penetrates the closure and extends into the solution, the diaphragm should be accurately centered in the tube.

B-3. Smooth operation of the syringe-cartridge combination cannot be expected

if the rubber plunger has a tendency to stick or move in a nonuniform fashion as it is forced through the tube.

B-4. There is some indication that large air bubbles in the tubes may be associated with more rapid deterioration of the solution.

B-5. Under the terms of the Federal Food, Drug and Cosmetic Act dental cartridges are regarded as ampuls. This item (B-5) is worded to avoid conflict with official requirements. (U.S.P. XIII, p. 665; N.F. VIII, p. 688—Determination of Volume.) The specific upper limit is established with consideration of the difference in the type of syringe employed with cartridge and ampul solutions.

B-8. Available evidence indicates that the specified pH range provides optimum conditions for stability of the anesthetic agent. This is also a desirable pH range from the standpoint of the stability of the vasoconstrictor.

B-9. The titratable acidity of the solution is a measure of the amount of alkali that must be furnished by the tissues in order to neutralize the acid in an injection of that solution. The titratable acidity is not related solely to the pH of the solution. The selection of pH 7.2 as the end point for the titration was governed by the following considerations: (1) The end point should be close to the normal physiological pH. (2) The procaine hydrochloride should not contribute materially to the titratable acidity.

B-10. This item corresponds to the limits established in the National Formulary for Procaine Hydrochloride Solution (2 per cent).

B-12. The residue from an accurately measured sample of the solution when dried to constant weight at 100 C. shall be not less than 90 per cent nor more than 110 per cent of the weight calculated from the stated formula. It is assumed that any chlorobutanol is entirely volatilized. The term "constant weight" means that there is a further loss of weight of no more than 1.0 mg. after an additional two hours of drying.

B-13. When the residue obtained in B-12 is dissolved in 2 normal hydrochloric acid, redried and then ignited at a temperature between 500 C and 600 C., the weight of the ash shall be not less than 85 per cent nor more than 115 per cent of that calculated from the stated formula. It is assumed that bisulfite will be changed to an equivalent weight of chloride.

"GERMICIDE" VS. "DISINFECTANT": A STATEMENT OF POLICY

For many years the Council on Dental Therapeutics has discouraged application of the terms "germicide" and "germicidal" to chemicals used in the disinfection of instruments and other apparatus in the dental office. This policy was based upon the common abuse of these terms rather than upon their definitions. There are undoubtedly many in the dental and medical professions who believe that a germicide can be relied upon to kill all pathogenic micro-organisms. This is not true of any germicide which is suitable for use on dental instruments, so far as the Council is aware. Adjectives such as "powerful" and "extraordinary" are often misleadingly applied to germicidal preparations.

The use of the terms "disinfectant" and "disinfecting" with reference to this class of products is favored. While these latter words are less susceptible to mis-

leading use, partly because they lack glamour, they are no more descriptive of the properties of the chemical than are "germicide" or "germicidal".[1, 2] Like "germicidal," "disinfecting" implies the killing of all pathogenic micro-organisms. Unfortunately single words which better describe the actions of these products are not available.

After careful consideration, the Council on Dental Therapeutics has decided to recognize the use of the terms "germicide" and "germicidal" with reference to those chemical agents which can be relied upon to kill all vegetative forms of micro-organisms (except possibly Mycobacterium tuberculosis) within five minutes under practical conditions of use.

A discussion of the properties and limitations of chemical disinfectants appeared in a recent issue of THE JOURNAL.[3]

1. Patterson, A. M., Meaning of "Antiseptic," "Disinfectant" and Related Words. *Am. J. Pub. Health* 22:465 (May) 1932.
2. Organic Mercurial Compounds as Bactericidal Agents—Report of the Council on Pharmacy and Chemistry. *J.A.M.A.* 115:2083 (Dec. 14) 1940.
3. Council Discusses Permissible Claims for Chemicals Proposed for Disinfection of Instruments—Report of the Council on Dental Therapeutics. *J.A.D.A.* 35:899 (Dec. 15) 1947.

COUNCIL LISTS PRODUCTS FOR "ACCEPTED DENTAL REMEDIES"

THE Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following products in the list of *Accepted Dental Remedies:*

Antibiotics and Antiseptics[1]

Crystalline Penicillin G Sodium—Merck: In vials containing 100,000, 200,000, 500,000 and 1,000,000 units. Manufactured by Merck & Co., Inc., Rahway, N. J.

Penicillin Potassium Troches, 1,000 Units: Stated to contain crystalline penicillin G potassium, tragacanth, acacia, sodium carboxymethylcellulose, cane sugar, magnesium stearate and flavor. In bottles of 24.

Penicillin Potassium Troches, 5,000 Units: Stated to contain crystalline penicillin G potassium, tragacanth, acacia, sodium carboxymethylcellulose, cane sugar, magnesium stearate and flavor. In bottles of 24 and 250.

Crystalline Penicillin G Potassium—Abbott: In vials containing 5,000,000 units.

Penicillin Potassium Buffered Tablets, 50,000 Units: Stated to contain crystalline penicillin G potassium, calcium carbonate, cane sugar, corn starch, acacia, talc and magnesium stearate.

Penicillin Potassium Buffered Tablets, 100,000 Units: Stated to contain crystalline penicillin G potassium, calcium

1. *A.D.R.*, ed. 14, p. 59.

carbonate, cane sugar, corn starch, acacia, talc and magnesium stearate. Manufactured by Abbott Laboratories, North Chicago, Ill.

Nutritional Factors[2]

Ascorbic Acid Tablets, 300 mg.: Each tablet is stated to contain 300 mg. ascorbic acid, U.S.P. Manufactured by Crest Laboratories, Inc., Burbank, Calif. Distributed by Formula Products Co., Los Angeles.

Enforbec Vitamin B Complex with C Tablets: Each tablet is stated to contain thiamin hydrochloride, 10 mg.; riboflavin, 5 mg.; niacinamide, 100 mg.; pyridoxine, 1 mg.; calcium pantothenate, 10 mg.; ascorbic acid, 100 mg.; liver extract B fraction, 1 grain; dried yeast, 1 grain; plus excipients, lubricants and binders. Distributed by Harrower Laboratories, Glendale, Calif.

Zinc Oxide Preparations[3]

Zinc Oxide, Analytical Reagent: Distributed by King's Specialty Co., Ft. Wayne, Ind.

2. *A.D.R.*, ed. 14, p. 136.
3. *A.D.R.*, ed. 14, p. 168.

Anesthetics—Local[4]

Procaine HCl 2%, Epinephrine 1:25,000: Each cubic centimeter is stated to contain procaine hydrochloride, 0.02 Gm.; epinephrine, 0.00004 Gm.; sodium chloride, 0.005 Gm.; sodium bisulfite, 0.0019 Gm., and distilled water. Marketed in 2.2 cc. tubes.

Procaine HCl 2%, Epinephrine 1:50,000: Each cubic centimeter is stated to contain procaine hydrochloride, 0.02 Gm.; epinephrine, 0.00002 Gm.; sodium chloride, 0.005 Gm.; sodium bisulfite, 0.0019 Gm., and distilled water. Marketed in 2.2 cc. tubes. Distributed by Procaine Products Co., Philadelphia.

Admission to *Accepted Dental Remedies* means that the product was found to conform to the rules of the Council when it was accepted. Accepted products are reconsidered periodically. The files of the Council contain information on many drugs and dental cosmetics, and inquiries are welcomed.—*Donald A. Wallace, Secretary.*

4. *A.D.R.*, ed. 14, p. 39.

CASES AND COMMENTS

Oral Pemphigus: Report of a Case. By M. G. Baum, D.D.S., Evansville, Ind.

A woman, aged 47 years, first was seen by one of my medical colleagues on August 24, 1938, for a complete diagnostic study. No serious organic disease was found. The patient was overworked, extremely nervous and apprehensive about herself. Since she was experiencing frequent premature heart beats, probably as a result of her physical condition, a cardiac neurosis had developed. She was certain she had heart disease. For almost ten years this woman has been under the care of the same internist. During that period he has found no reason to change his original diagnosis.

In February, 1945, the patient came to my office complaining of discomfort between the left lateral incisor and cuspid. Nothing unusual was noted, and I curetted a shallow pocket between the two teeth and painted the area with dilute Talbot's solution. I told her to call me if there was further difficulty. The patient returned in two days and as the area involved showed no unusual signs of irritation, it was again painted with Talbot's solution and the patient was dismissed.

When she failed to improve, she was referred by her physician to an oral surgeon. When he saw her in March 1945 he was noncommittal as to the diagnosis. The previously affected region and new ones which had become involved in the meantime were treated with a 10 per cent solution of chromic acid. When the condition did not respond to three treatments, the surgeon was unwilling to accept further responsibility in the case.

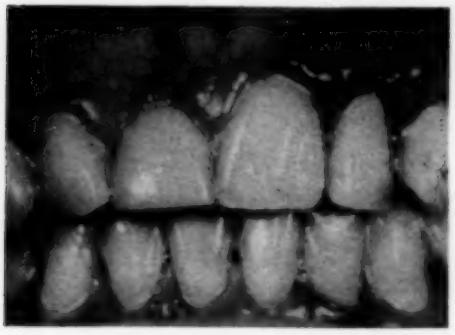

Fig. 1.—Note blisters over left incisors and cuspid and between lower right central and lateral incisors. The labial mucosa from cuspid to cuspid is a fiery red color and is sensitive to touch

Fig. 2.—Note turgid blisters above lateral incisor and cuspid. Numerous blisters larger than these have been present on same site, but they usually occur at night or early in the morning and erupt, shedding a watery fluid, before patient can be photographed

The patient did nothing else about her condition until June 1945. At that time she consulted a competent otolaryngologist. He treated her mouth with a 10 per cent solution of chromic acid every day for four weeks. There was no improvement. The patient then returned to the internist previously mentioned. The day she was seen by him, her gums and the inside of her lips were covered with a shower of turgid blister-like areas (Fig. 1). Most of these had not ruptured.

It was the opinion of the internist that the disease of the mouth was systemic. He referred her to Richard Weiss, professor of dermatology at Washington University and Barnes Hospital, St. Louis. Dr. Weiss made a diagnosis of pemphigus. He commented on the fact that all of the lesions were in the mouth, no blisters having been seen on the body at any time. A bland mouthwash, liquor antisepticus (N.F.) was prescribed. The administration of iron cacodylate also was advised, and the internist injected intravenously 1 grain each day for a week, and then 1 grain three times a week for the next six to

eight weeks. At the end of this period the patient was seen again by Dr. Weiss who recommended that she keep in touch with her physician.

Since that time, the patient has remained under the care of her physician. She has had no lesions on her body. The condition of her mouth has changed little. Her general health is fair, and she works every day.

It is an interesting observation that the blisters in her mouth come in showers. For two weeks there may be marked improvement on no treatment. Then without warning the labial gingivae will show numerous blisters, all of which vary in size and turgidity (Fig. 2). The labial mucosa is at all times a fiery red color.

I report this case not so much because of the low incidence of oral pemphigus but because of the peculiar localization of the lesion and the long duration of the disease. Only the labial mucosa is involved. No other body surface has been attacked. The gingival tissue under upper and lower vulcanite partial dentures has remained normal, as has the lingual aspect of both jaws.—*618 Hulman Building.*

The Efficacy of Fraction I of Normal Human Blood Plasma in the Extraction of Teeth in a Hemophilic Patient.

By George E. Wheeler, Jr.,* D.D.S., and Robert R. Wadlund,† M.D., Bridgeport Hospital, Bridgeport, Conn.

Fraction I of normal human blood plasma, or antihemophilic globulin, has been used with success in the extraction of teeth in a hemophilic male in whom previous extraction without globulin resulted in profound hemorrhagic shock.

Material

The material, prepared by the American Red Cross in collaboration with the Department of Physical Chemistry, Harvard Medical School, is Fraction I of normal human blood plasma containing the bulk of fibrogen and, in addition, a closely associated globulin active in lowering the blood clotting time of hemophilic persons. It is dispensed in vials containing approximately 200 mg. of sterile dry Fraction I, which must be dissolved in 5 cc. of sterile distilled water, and the solution administered intravenously. In fifteen to thirty minutes one vial will lower the venous coagulation time in hemophilia toward normal and its effect will last about four hours.

History

A 28 year old white man was readmitted to the Bridgeport Hospital, on June 6, 1948, for the extraction of carious teeth. On eleven previous medical admissions it had been found that he consistently had a venous coagulation time which was prolonged from one to two or more hours beyond normal, with normal bleeding times, prothrombin times and platelet counts. These laboratory findings, together with his clinical evaluation, substantiated the diagnosis of hemophilia. One of three brothers had died of bleeding at the age of 6.

On the last previous admission, October 31, 1947, for hemophilic manifestations of medical interest, the patient had a venous coagulation time of two hours and forty minutes. Thirteen days later, on the day teeth were to be extracted, 4 pints of whole plasma reduced the coagulation time to twenty-two minutes. At noon November 13, immediately after a plasma transfusion, two lower left molars were removed and 1 pint of plasma was given. This was followed by 1 pint of whole blood in the evening. The patient continued to bleed all through the night, however, and although 2 more pints of whole blood and 4 more pints of plasma were administered on the following day, he suffered shock and exhibited a blood pressure of 64 systolic and 0 diastolic and a pulse rate of 164.

Antihemophilic globulin was procured at 10:00 p.m. November 14, and in fifteen minutes 400 mg. reduced the coagulation time from eight minutes to five minutes. This medication, combined with packing of sockets with gauze squares over absorbable gelatin sponge soaked in thrombin, and another blood transfusion, finally stopped the bleeding. For the next week the sockets remained dry. Five pints of blood were given to correct the anemia.

On November 22, nine days after extraction, the sockets again began to ooze, so that on the following day a large oozing clot had to be removed and the sockets were again packed tightly with absorbable gelatin sponge and

*Attending oral surgeon.
†Intern.

thrombin. This local treatment was preceded by the intravenous injection of 400 mg. of antihemophilic globulin, which reduced the venous coagulation time from eleven minutes to eight minutes. No further bleeding was noted. Four days later he was discharged.

When admitted on June 6, 1948, for the extraction of his lower right third molar tooth, 1,400 mg. of Fraction I, containing antihemophilic globulin, were immediately available. Subsequently another 2.0 Gm. were procured. Three vials, or 600 mg., were administered in the six hours preceding the extraction. This reduced the venous coagulation time from one hour and twenty minutes to eighteen minutes. Another 200 mg. were given following the extraction. Then there was no bleeding at all until the second day when a small, oozing clot which had enlarged was removed. Another 200 mg. of globulin were given, keeping the coagulation time down to twenty minutes.

On the third day, when a coagulation time of one hour and twenty minutes existed, another clot formed. This also was removed and 200 mg. of globulin were administered. For another two days there was no oozing, but on the fifth day after extraction, a slight amount of oozing was noted. Two hundred mg. of antihemophilic globulin were given, followed by 600 mg. the next day. For the next four days the socket remained dry and the patient was discharged. At no time was there any significant fall in blood pressure or rise in pulse. The blood loss was so minimal that neither blood nor plasma administration was indicated.

Comments

From the report on this case of the two admissions to the hospital during which teeth were extracted, it will be noted that in the first instance, Fraction I (antihemophilic globulin) of normal human blood plasma was not available for use until about thirty-six hours after extraction, but in the second instance it was given preoperatively.

On the first occasion, the patient was well into shock from hemorrhage following the extraction, notwithstanding the fact that he received 6 pints of plasma and 3 pints of blood in the thirty-six hour period preceding the administration of globulin. By the globulin injection, the coagulation time was lowered only from eight minutes to five minutes, yet the bleeding stopped. After five subsequent transfusions of whole blood in as many days to correct anemia, the sockets of the two lower left molars again began to ooze, and again antihemophilic globulin was given, in a 400 mg. quantity. This successfully combated the oozing so that he could be discharged four days later.

In the second instance, 600 mg. of Fraction I were given in a six hour preoperative period. This effectively lowered the venous coagulation time from one hour and twenty minutes to eighteen minutes. Immediately following the extraction of his lower right third molar tooth there was minimal bleeding. Twice, on subsequent days, when the socket began to ooze, the situation was readily controlled without significant blood loss by further administration of antihemophilic globulin. In all, 2.0 Gm. were required in the twelve day hospital stay; 600 mg. before and 1,400 mg. after the extraction.

The deductions evolved from this case indicate that although the results, in the first instance of application, are inconclusive, yet the clinical picture, in the second instance, is an unequivocal illustration of the efficacy of Fraction I from normal human blood plasma in combating the bleeding tendency in the hemophilic patient.

Conclusion

Fraction I of normal human blood plasma containing antihemophilic globulin can effectively control the bleeding tendency in hemophilic patients following the extraction of teeth.—*886 Main Street.*

BOOK REVIEWS

Physiologic Therapy in Respiratory Diseases. By Alvan L. Barach, M.D. Second edition. 408 pages with 74 illustrations. Index. Price $9. Philadelphia: J. B. Lippincott Company, 1948.

The author, in the preface to this second edition (the first appeared in 1944 under the title *Principles and Practices of Inhalational Therapy*), states: "In this book special emphasis has been accorded to the pathologic physiology of each clinical entity and the physiologically based procedures by which reversible pathology in the lungs and the bronchi are combatted."

The author develops the background of inhalational therapy, including aerosol therapy. He then develops the problems associated with anoxia. Following this introduction, he devotes his attention to specific diseases; each of the next twenty chapters covers a specific entity. The concluding chapters deal with types of inhalational apparatus, with a discussion of the care and methods of gas analysis applicable to the equipment.

This edition is completely revised and enlarged and presents the most recent advances in medical therapy for pulmonary disease. It should be in the working library of all physicians interested in pulmonary diseases and every dentist using nitrous oxide should read the chapter on anesthesia and anoxia.—*Eugene L. Walsh, M.D.*

Detailed Atlas of the Head and Neck. By Raymond C. Truex, M.S., Ph.D. and Carl E. Kellner. First edition. 162 pages, with 136 figures. Price $15. New York: Oxford University Press.

This welcome addition to American anatomical atlases gives evidence of an ambitious plan, extensive original dissections and good collaboration between anatomist, medical illustrator and publisher. The anatomical preparations were made by a skillful dissector, Dr. R. C. Truex, at the College of Physicians and Surgeons of Columbia University. The artist was C. E. Kellner whose contributions and responsibility are recognized by co-authorship.

The atlas is organized in four main sections. Part I portrays regional anatomy of the head and neck, including the topography, gross morphology and special dissections of the brain. It consists of 82 figures, 26 of which pertain to the brain. Relationships rather than detailed structural arrangements are emphasized throughout. The fields of dissection are extended beyond limited neck regions to demonstrate the continuity of layers and organs in crucially important neighboring areas such as the axilla and thorax. Dentists and students will find special interest in the approach and display of the infratemporal, retromandibular and lingual regions.

Part II deals with osteology of the skull and of the cervical vertebral column. It contains 22 figures including excellent half-tone views of the whole skull which are duplicated with colored drawings for adequate, accurate labeling. Anglicized terms are used throughout the book. Dentists, however, may miss illustrations of the disarticulated skull-bones or a full view of the mandible with its associated ligaments.

Part III portrays frontal sections of the head and neck in 11 successive planes and nine detail figures. There is a discrepancy in the symmetry between right and left sides as the left side was cut purposely at a slightly deeper plane. This allowed the portrayal of different topographical relationships.

Part IV consists of 18 figures of nine transverse sections, both the inferior and superior view of each cut being shown. The chosen basal plane does not correspond to the conventional Frankfort plane which generally is accepted for orientation of the skull.

There is a valuable index consisting of 26 pages of anatomical terms with many cross-references.

By way of qualification it may be said that the purely anatomical component of the work, the emphasis of topographical relationships and the identification of structures are better than their artistic portrayal. The illustrator has used a rather "heavy brush" especially where thin and slender muscles are concerned. One misses the finer "feel" and differentiation in texture and structural arrangement between various muscles. There is a degree of coarseness and monotony in their treatment. This holds true also for fiber bundles of the brain. The portrayal of the teeth and the lack of

their characteristic features in many figures may also be disappointing to the dental student. From an anatomical and esthetic viewpoint one might be perturbed by an apparent disproportion between facial height and total head height.

The title of the volume, "Detailed Atlas," is perhaps not fully justified as a deliberate selection of the material has been made. The atlas contains no other text than the carefully written legends for the figures. But in spite of these negative comments, the book is worthy of recommendation.—*A. Zimmermann.*

Society As the Patient, Essays on Culture and Personality. By Lawrence K. Frank. 395 pages. Price $5. New Brunswick: Rutgers University Press, 1948.

Frank is director of the Caroline Zachry Institute of Human Development. In this volume he presents selections from his writings in professional journals over the past 25 years. The ills which afflict society are discussed from a psycho-cultural angle, utilizing the methods of psychiatry, psychoanalysis, psychology and mental hygiene. The author opines that the greatest need of society today is to re-examine its present modes of thinking and to discard such traditions and customs as hamper the development of the "good life."

An interesting observation is made by the author regarding scientific controversy in which he points out that "much time and energy and space are being sacrificed to the practice of controversy, which is primarily an expression of personality clashes irrelevant to scientific advances." It can be said for research workers in dentistry that personal controversy is largely a thing of the past, although differences of opinion and in actual findings are quite common, as they should be.

Readers of this book will find an interesting appraisal of society and of the complexity of currents and crosscurrents in human progress. —*J. A. Salzmann.*

Medicine in the Postwar World. The March of Medicine, 1947, six lectures. Number XII of the New York Academy of Medicine lectures to the laity. 109 pages. Index. Price $2. New York: Columbia University Press, 1948.

This book is a publication arising out of the twelfth series of lectures to the laity given under the auspices of the New York Academy of Medicine. These annual lectures have been published for a number of years and constitute an interesting review of current interests and trends in medicine. In this volume appears an essay, "The Role of the Medical Man in War," by Major General Norman T. Kirk, former Army surgeon general; an article, "The Atom in Medicine," by Arthur K. Solomon, Ph.D., of the Department of Physical Chemistry, Harvard Medical School; a provocative and witty piece entitled, "Are Parents Necessary?" by René A. Spitz, M.D., of the New York Psychoanalytic Institute; a dissertation on what the war has taught us about culture, by Nolan D. C. Lewis, M.D., of the New York State Psychiatric Institute and Hospital; an historical essay on American pioneering in psychiatry, with a very interesting presentation of the work of Dorothea Dix, by Howard W. Haggard, M.D., Director, Laboratory of Applied Physiology of Yale University; and an essay on anti-infectious agents of natural origin (antibiotics) by René J. Dubos, Ph.D., of the Rockefeller Institute for Medical Research.

With the exception of the Spitz article, which is lightly satirical, these are serious, highly interesting articles packed with information. They should appeal to the reader who likes to be well informed, but before he reads them he needs a certain amount of background information for interpretation. This book is recommended for those well versed in medical and public health points of view.—*W. W. Bauer, M.D.*

Treatment by Diet. By Clifford J. Barborka, M.D. Fifth edition. 784 pages with 14 illustrations. Index. Price $10. Philadelphia: J. B. Lippincott Company, 1948.

This attractive volume is devoted to the role of diet in the treatment of disease and the maintenance of normal health. The text is well organized and extremely readable. It contains brief but practical discussions of deficiency diseases and provides the information necessary for planning the diets used in the treatment of these conditions. Diseases in which the role of nutrition is not fully established also receive adequate consideration.

Approximately ten pages are devoted to a discussion of dental caries but the author, in

an attempt to maintain an unbiased view of this controversial subject, reached conclusions which are not justifiable in the light of our present knowledge of this disease. He states: "Until we know the role of the many food factors as entities in caries we should merely insist that the patient follow a normal well-balanced diet as outlined in the chapter on diet and health."

It definitely has been established that a well-balanced diet will not control dental caries if the diet contains sugar. It also is known that freedom from caries has been demonstrated in large groups of persons whose diets are grossly inadequate.

The volume contains all of the information necessary for prescribing sugar-free diets which are adequate in a nutritional sense and which are effective for caries control. It is unfortunate that the author did not recommend the use of these diets for this purpose.—*Philip Jay.*

Pediatric Anesthesia. By M. Digby Leigh, M.D., and M. Kathleen Belton, M.D. 240 pages with 84 illustrations. Index. Price $5.50. New York: The Macmillan Company, 1948.

This volume, the first to deal exclusively with the principles and technics of anesthesia in infants and children, is a comprehensive, detailed work. It is, in addition, highly readable and interesting.

An excellent first chapter on the often neglected subject of preoperative preparation of the young patient emphasizes the necessity of obtaining the child's confidence, as well as the specific medical and physical prerequisites to anesthesia. Next the authors present the physiology of respiration and circulation, and the stages and planes of anesthesia, with particular reference to children.

The following five chapters take up in great detail the various technics and routes of administration of anesthetic agents including spinal, local, intravenous and inhalation anesthetics. The next section contains a list of the common pediatric operations with information on the choice of agent and technic for each procedure. A chapter is devoted to anesthesia for dental fillings, extractions and other oral surgery.

The final chapters include an excellent discussion of anesthetic complications and of post-operative care, including oxygen and fluid therapy. I recommend this valuable contribution to medical literature as a necessary addition to the library of the anesthetist, pediatric surgeon, and oral surgeon and as desirable reading for all physicians and dentists.—*Mary R. Richards, M.D.*

Preventive Medicine and Public Health. By Wilson G. Smillie, A.B., M.D., D.P.H. 607 pages. Index. Price $6.00. New York: The Macmillan Co.

This book deals primarily with the fundamentals of preventive medicine and public health. It is written for medical students, although it will prove helpful to dental students, especially those who contemplate a public health career.

The author makes a distinction between preventive medicine, which he considers largely a function of the private practitioner in the promotion of individual and family health, and public health which is a community function. He regrets the preoccupation of the private practitioner in the treatment of the individual's current malady to the exclusion of the individual as a social being, a unit of the family and a member of the community. As he states, "patients do have families and must live in communities."

The book deals with environmental sanitation, vital statistics and public health administration in an elementary manner, although it does stress the essentials of these subjects and their social implications. Communicable disease control, child hygiene and adult health promotion and protection are covered effectively.

The chapter on dental health is incomplete, but if present day medical students would study it they would have a much better understanding of dental health problems than did their predecessors. This chapter includes a paragraph on dental prepayment insurance, copied from a 1944 report of the American Dental Association entitled "A Proposed Plan for Prepayment of Dental Insurance." The author does not recommend the plan but presents the principle of prepayment dental insurance as a possible means of reducing the backlog of dental defects.

This book is recommended to all dentists and dental students interested in improving their knowledge of public health.—*Frank C. Cady.*

CURRENT LITERATURE

Absorbable Hemostatic Material (Oxycel). Nicholas G. Migliaccio. New England D. J. 1:21, January 1948.

An absorbable hemostatic material, oxidized cellulose ("Oxycel"), is described, and 5 case reports illustrate its uses in minor oral surgical operations. The chief objection to oxidized cellulose is the fact that it cannot be resterilized; once the vial is opened the unused portion can be used only on surface wounds.

Advantages of oxidized cellulose are that it has prompt and effective hemostatic action; is absorbed completely; obliterates large cavities; prevents breakdown of large blood clots, thereby permitting healing by first intention; prevents secondary hemorrhage; promotes rapid healing; prevents postoperative edema and pain, and can be used as a carrier of medication.—*James Springer.*

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The Effect of Human Saliva on the Cholera Vibrio in Vitro: A Pilot Study. Clarence E. Dawson and Wilson Blagg, United States Naval Medical Research Unit No. 3, Cairo, Egypt.—547.

Occlusion as a Factor in Dental Caries of Albino Rats (Rattus Norvegicus). H. R. Hunt and C. A. Hoppert, Michigan State College.—553.

The Effect of Carbohydrates on Experimental Caries in the Rat. Gerald J. Cox, Mary L. Dodds, Margaret Matuschak Levin and Harold C. Hodge, Mellon Institute and University of Rochester.—562.

Studies of the Microbiology of Caries. II. The Acid Fermentation in the Dental Plaques in Situ Compared With Lactobacillus Count. Allan Stralfors, Dental College and the State Bacteriologic Laboratory, Stockholm, Sweden.—576.

Studies of the Microbiology of Caries. III. The Buffer Capacity of the Dental Plaques. Allan Stralfors, Dental College, Stockholm, Sweden.—587.

The Salivary Amylase Activity of Carious and Noncarious Individuals. W. C. Hess and B. T. Smith, Georgetown University.—593.

Studies of the Bacterial Plaque and Dental Caries. I. Method for the in Vivo Production of Bacterial Plaques Suitable for Microsectioning. John Ennever, Hamilton B. G. Robinson and Paul C. Kitchin, Ohio State University.—599.

Variations in Salivary Protein Concentration. Robert J. Gorlin, Columbia University.—603.

The Organic Elements of the Enamel. I. A Study of the Principal Factors Involved in the Histological Preservation of the Organic Elements of Enamel and Other Highly Calcified Structures. Reidar F. Sognnaes, Harvard University.—609.

The Location of the Zone of Disintegrating Epithelial Attachment Cuticle: Relation to the Cemento-Enamel Junction and to the Outer Border of the Periodontal Fibers on Some Tooth Specimens. Charles C. Bass and Harold M. Fullmer, Tulane University and Charity Hospital of Louisiana.—623.

Chemical Analysis of Teeth Showing Unusual Wear. Mary Jane Bird, Edward Kelman, Hobart Lerner, David Rosenfeld, Victor Totah and Harold C. Hodge, University of Rochester.—629.

Radioactive Phosphate Permeability in Dentin Following the Use of Medicaments. Melvin H. Amler, New York University.—635.

The Development and Morphology of Physiological Secondary Dentin. Sidney Benzer, New York University.—640.

The Effect of Human Saliva on the Cholera Vibrio in Vitro: A Pilot Study. Clarence E. Dawson and Wilson Blagg.

Great individual differences in susceptibility to cholera stimulated preliminary investigations into the body's self-regulatory defense mechanisms. As infecting bacteria enter the body in contaminated foods, the study was outlined to consider first the effect of saliva on the cholera vibrio *in vitro*.

Saliva from normal healthy persons was found to be active against the test organism, and the degree of lysis was observed with the aid of a spectophotometer or a photoelectric calorimeter. It appeared that the agent either was absent or evinced minimal activity in saliva from cholera patients, indicating that the inhibitory potency was perhaps connected with the state of health of an individual. The

active principle appeared to be a component of salivary secretion and to have properties somewhat similar to those of enzymes.

Occlusion as a Factor in Dental Caries of Albino Rats (Rattus Norvegicus). H. R. Hunt and C. A. Hoppert.

More than ten years of selection, progeny testing and brother-with-sister inbreeding have demonstrated that heredity is a factor in dental caries of the rat. The caries-producing diet has consisted of coarsely ground hulled rice, whole milk powder, alfalfa leaf meal and sodium chloride. An average of about 292 days more is required for development of dental cavities in the resistant line than in the susceptible line. At present 5,879 rats have been studied. The susceptible stock has become nearly uniform, but variability remains high among the resistant animals.

The upper and lower molars of 180 resistant rats were studied with the dissecting microscope, and it was discovered that in many cases one or more of the molars in the upper jaw had disappeared, which suggested that lack of a cavity in a lower molar might be due to disappearance of the opposing upper molar. This was proved by removing one or more upper molars on one side of 108 susceptible rats, 30 days old. Caries developed in the unopposed lower molars in 154.1 $\pm$ 6.5 days, and in the opposed lower molars in 26.3 $\pm$ 0.9 days.

The Effect of Carbohydrates on Experimental Caries in the Rat. Gerald J. Cox, Mary L. Dodds, Margaret Matuschak Levin and Harold C. Hodge.

Forty-eight rats were placed for six weeks on the Hoppert-Webber-Canniff diet, after which 13 of them were given a diet made by adding an equal weight of confectioner's sugar to the HWC diet. These diets were fed for the remainder of the experimental period of 104 days. On the average, the result in terms of number of carious teeth and number of missing cusps was the same in the experimental rats as in the control rats. The experimental rats exhibited twice as many teeth totally destroyed as did the control rats. Apparently, excessive amounts of sugar do not initiate rat caries but cause rapid extension of existing cavities.

One hundred and twenty-two male and female rats were given HWC diets for eight weeks. Twenty rats fed coarse corn and 13 rats fed fine corn were killed at that time; the average caries scores were 4.8 and 2.6, respectively. The remaining rats were divided into groups of 12 to 16 each, and they were fed diets containing (1) corn ground coarse or fine, and (2) low or high carbohydrate content, but without corn particles. The rats fed high carbohydrate diets in each instance had higher average caries scores than those maintained on the low carbohydrate diet.

One hundred and eighty rats were placed on a specially modified HWC diet in which a synthetic milk replaced the powdered milk usually included. The synthetic milk contained a single sugar, sucrose or glucose; in a control group, uncooked starch was added in an equivalent amount. After eight additional weeks on these continuation diets it was shown that, on the basis of either whole mouth or tooth-by-tooth comparison, rats fed uncooked corn starch had less progress of cavitation than rats fed fermentable sugars.

Studies of the Microbiology of Caries. II. The Acid Fermentation in the Dental Plaques in Situ Compared With Lactobacillus Count. Allan Stralfors.

By means of an electrometric pH meter and an antimony electrode, the pH variations in dental plaques were determined after rinsing the mouth with glucose solution. Correction was made with respect to the potential between the plaque and the saliva. There was a rapid decrease in pH in the first 10 to 15 minutes, a minimum was reached and then there was a slow increase to the original pH value.

Immediately afterward, stimulated saliva was taken for determination of the amount of lactobacilli. A statistical analysis of tests on 110 persons showed that higher pH minimums of plaque fermentation curves were associated with fewer lactobacilli, and lower pH minimums, with greater amounts of lactobacilli.

Studies of the Microbiology of Caries. III. The Buffer Capacity of the Dental Plaques. Allan Stralfors.

By means of an electrometric pH meter, a special micro glass electrode and a microburet, the buffer capacity of dental plaques was determined in different pH ranges. The

buffer capacity of the plaques was found to be much greater than that of the saliva. It was suggested that the plaque has the ability to store the acid produced by bacteria and thus hinder the saliva from neutralizing it. This may be of great importance for the development of caries.

The Salivary Amylase Activity of Carious and Noncarious Individuals. W. C. Hess and B. T. Smith.

Activity of salivary amylase can be measured in serially diluted saliva by the quantitative estimation of total reducing sugar by the Folin-Wu method. Amylase activity is directly proportional to concentration when pH, temperature and time are kept constant.

Salivary amylase activity in the same individual does not vary significantly from day to day.

There was no significant difference between the salivary amylase activity of a series of 20 noncarious persons and a series of 36 persons with caries of varying degrees.

Studies of the Bacterial Plaque and Dental Caries. I. Method for the in Vivo Production of Bacterial Plaques Suitable for Microsectioning. John Ennever, Hamilton B. G. Robinson and Paul C. Kitchin.

Experimentation has indicated that qualitatively similar bacterial plaques can be produced in the mouth on various types of surfaces, including celloidin. Removable appliances, each with a celloidin tooth to supply a missing molar, were placed in the mouths of subjects for varying periods. At intervals ranging from 19 to 30 hours the appliances were removed and the plaque-bearing celloidin was washed, fixed, sectioned at 8 minutes and 10 minutes and stained.

The prepared sections revealed a matrix structure of elongated rod forms extending out from the tooth surface at approximately right angles. Supported in this framework were other organisms of different morphologic structure. Correlated cultural studies are in progress.

Variations in Salivary Protein Concentration. Robert J. Gorlin.

In the course of investigation of salivary protein by use of the Tiselius electrophoretic apparatus, the author observed variation in both pattern and mobility of the several components. This variation led to a study to determine whether a constant amount of protein could be obtained by uniformity in collection technic. Previous studies have demonstrated wide variations in salivary protein values, the mean values establishing salivary protein concentration at 260 to 333 mg. per 100 cc. of saliva. However, the standard deviations in these studies have varied from 45 to 118 mg. per 100 cc., demonstrating the wide range of values.

In this study, several variables were made constant: for example, salivary samples were uniform as to amount collected, time of salivary stimulation, size of paraffin block, and time interval between collection and analysis. Samples were taken from 35 volunteers who had no breakfast, for purpose of minimizing the effect of protein intake. The method of Greenberg, as adapted for salivary protein by Krasnow, was utilized on 1 cc. samples. A mean value of 280.4 mg. per 100 cc. was obtained. The standard deviation of the series was 65.9 mg. per 100 cc. It may be concluded that control of the several factors considered by the author has no effect on the variability of salivary protein concentration.

The Organic Elements of the Enamel. I. A Study of the Principal Factors Involved in the Histological Preservation of the Organic Elements of Enamel and Other Highly Calcified Structures. Reidar F. Sognnaes.

An analysis of present knowledge suggests that the process of decalcification is the most critical single step in the isolation of the organic framework of highly calcified structures.

Demineralization of mature enamel without destruction and distortion of the organic matrix is benefited by the use of dilute acids, which at the same time act as good protein fixatives; by combination of acids and fixation fluids; by the suppression of forceful carbon dioxide formation (using low temperature or increased atmospheric pressure, or both), and finally by the prevention of rapid dialyzing actions in the presence of organic surface membranes. Apparatus and procedures are described which utilize these principles. Successful recovery of the organic framework of the enamel *in toto* and in sections is presented in text and illustrations.

The Location of the Zone of Disintegrating Epithelial Attachment Cuticle: Relation to the Cemento-Enamel Junction and to the Outer Border of the Periodontal Fibers on Some Tooth Specimens. Charles C. Bass and Harold M. Fullmer.

The zone of disintegrating epithelial attachment cuticle (zdeac) consists of a line which can be demonstrated on extracted tooth specimens by appropriate technic. It is seen as a heavier stained line, usually extending in an irregular course around the tooth. This line accurately indicates the location of the outer border of the epithelial attachment and shows how far this outer border has receded apexward.

The location of the cemento-enamel junction does not change.

Normally the periodontal fibers extend to the cemento-enamel junction. As these fibers are destroyed in the usual course of the pathological process, periodontoclasia, the outer border of these fibers moves apexward along the cementum. At the same time the epithelial attachment moves downward to take the place on the cementum formerly occupied by the periodontal fibers.

The zone of disintegrating epithelial attachment cuticle moves at about the same rate as the outer border of the periodontal fibers. Therefore the location of this zone and the outer border of the fibers are closely related at all times. They have no fixed relation to the cemento-enamel junction.

These facts conform to the local pathologic process—periodontoclasia—and not to a theoretical physiologic process of "continuous passive eruption."

Chemical Analysis of Teeth Showing Unusual Wear. Mary Jane Bird, Edward Kelman, Hobart Lerner, David Rosenfeld, Victor Totah and Harold C. Hodge.

Teeth from a full mouth extraction were analyzed for organic matter, calcium, phosphorus and magnesium. The teeth on the right side of the jaws all had normal contours while those on the left were cuspless. Chemical analysis showed no large differences in the composition of the teeth on the two sides of the mouth, although the slightly greater organic content of the cuspless teeth may be evidence of a significant decrease in resistance to attrition.

Radioactive Phosphate Permeability in Dentin Following the Use of Medicaments. Melvin H. Amler.

Various medicaments are used in cavity preparations prior to the insertion of filling materials. They are used not only as sterilizing agents, but also with the expectancy that they will coagulate the dentinal lymph and fluid, thereby mechanically sealing off the dentinal tubules and thus decreasing the permeability of the dentin. Clinically, it would be desirable to decrease dentin permeability so as to diminish pulpal reaction to external stimuli and to lessen the possibility of bacterial invasion and the opportunity for recurrent decay.

The actual effect of these medicaments on the penetration of dentin by radioactive phosphorus has been studied in comparison with corresponding controls, using dogs as subjects. Oxyphosphate cement proved to be impervious to penetration by P_{32}, but with all other medicaments penetration was greater than when no medicaments were used. Penetration of dentin was highest in the phenol-treated cavity and less in the order indicated: phenol followed by alcohol, fluorine, silver nitrate followed by eugenol, and cavity varnish.

The Development and Morphology of Physiological Secondary Dentin. Sidney Benzer.

Examination of ground sections of 100 permanent normal erupted teeth and 40 impacted teeth, multirooted and single-rooted, disclosed a layer of dentin which was formed after primary dentin was deposited. The chronologic development of this tissue was traced in specimens from patients 7 to 65 years of age. There is usually a sharp line of demarcation between the original "primary" layer and the new layer called "physiological secondary dentin." Detailed study revealed several morphologic types of physiological secondary dentin.

Physiological secondary dentin appears in normal and impacted teeth, both permanent and deciduous, and in teeth from ovarian dermoid cysts, as do the other dental tissues. This indicates that physiological secondary dentin is a normal component of the tooth and is not the result of function, irritation by oral fluids or caries, as other authors have previously reported.

LIST OF DENTAL OFFICERS

SEPARATED FROM ARMY DENTAL CORPS

THE following list of dental officers separated from the Army Dental Corps does not include rank because such information is no longer furnished by the Surgeon General's Office. Publication will be given to other names as soon as possible.

Alabama	
Greenville	Hopkins, William B.
Arizona	
Phoenix	Schwartz, Bert B.
California	
Delano	Nagatani, James K.
El Cerrito	Sheeran, William M.
Lemon Grove	McCarthy, Harold D.
San Francisco	Bakker, Harold
San Francisco	Gilberg, Marvin R.
San Francisco	Hong, Frederick H.
San Francisco	Johnson, Emery F., Jr.
San Francisco	Rudine, Francis B.
Simi	Ross, Thurston H., Jr.
Colorado	
Brush	Friehauf, Wilbert D.
Connecticut	
Naugatuck	Healy, William J.
New Haven	Rohinsky, Irving
Florida	
Jacksonville	Deal, James F., Jr.
Lakeland	Beal, Luther M.
Miami	DeMirza, William P.
Georgia	
Athens	Moore, Robert B.
Calhoun	Ellis, Marvin M.
Macon	Barksdale, Edgar W.
Hawaii	
Ohau	Beardmore, Stanley J.
Illinois	
Berwyn	Mashek, John L.
Chicago	Borkenhagen, Robert H.
Chicago	Green, Philip
Chicago	Jaffe, Eugene
Chicago	Kolodziejczyk, Joseph
Chicago	Muller, Carl H.
Chicago	Pelka, John A.
Chicago	Peterson, Charles J.
Chicago	Tobiaz, Alfred E.
Cicero	Rimkus, Edward R.
Oak Park	Sayre, Charles M.
Indiana	
Bloomington	McDaniel, Glen M.
Indianapolis	Moore, Dudley S.
Indianapolis	Peden, Robert L.
Muncie	Ryan, Robert C.
New Philadelphia	De Jean, Edgar K.
Iowa	
Boone	Spies, Henry J.
Centerville	Peasley, Robert L.
Iowa City	Patrick, Bernard F.
Kansas	
Arma	Brentari, John, Jr.
Louisiana	
Lafayette	Failla, Joseph A.
New Orleans	Di Leo, Sylvester J.
New Orleans	Lambright, Edwin
New Orleans	St. Romain, Samuel J., Jr.
Maryland	
Baltimore	Gordon, Max
Baltimore	Smith, Norval F.
Massachusetts	
Greenfield	Witek, John J.
Haverhill	Wozmak, Eugene H.
Lynn	Staples, William R.
Malden	Holber, Nathan W.
North Adams	Hoff, Charles J.
Springfield	Morgan, Warren A.
Michigan	
Bay City	Pearsall, Harry J.
Bronson	Glen, Harrie J.
Cedar Rapids	Severa, Leo G.
Minnesota	
Perham	Paulbeck, James P.
St. Paul	O'Connor, William P.
Mississippi	
Greenwood	Sneed, Woodford W.
Missouri	
Caruthersville	Pinion, Joe D.
Kansas City	Piper, Philip F.
Kansas City	Terrill, Howard K.
Macon	Jones, Fred N.
Maysville	Holt, Jack C.
Mexico	Baker, Floyd E.
University City	Norris, Russell S.
Nebraska	
Bloomfield	Wolpert, Francis J.

Minden	Christensen, Hans K.
Omaha	Jackson, Wendell T.

New Jersey

Clifton	Werderitsch, John F.
Dunellen	Rankin, Henry J.
Madison	Oliva, Angelo R.
Margate	Goodfriend, Richard I.
Newark	Lee, Saul P.
Oaklyn	Silver, Marvin
Plainfield	Brenner, Robert E.

New Mexico

Albuquerque	Coon, Corliss D.

New York

Bronx	Bregman, Marvin A.
Bronx	Shipper, Philip E.
Brooklyn	Altman, Lester
Brooklyn	Hamburg, Harold L.
Brooklyn	Hoffman, Herbert P.
Brooklyn	Kagan, William R.
Brooklyn	Kaplan, Samuel
Brooklyn	Patella, John
Brooklyn	Spector, Leonard A.
Brooklyn	Weiler, Lester
Brooklyn	Weiss, George A.
Brooklyn	Wolf, Marvin
Herkimer	Burchesky, Robert Z.
Jackson Heights	Morris, Robert D.
Jackson Heights	Wuthenow, Albert E.
Jamaica	Weinstein, Murray
New York	Edelstein, Martin
New York	Frist, Harry
New York	Kaufman, Sheldon D.
New York	Klein, Edward
New York	Miller, Stanley H.
New York	Muccia, Daniel A.
New York	Riklin, Bernard M.
New York	Silver, Milton
New York	Spector, Daniel H.
New York	Weintraub, David
Rochester	Halik, Frederick J.
Staten Island	Mihalski, Edmund R.
Tarrytown	Friedman, Meyer M.

North Carolina

Cherryville	Harrelson, Henry C., Jr.

Ohio

Cleveland Hghts.	Bubis, Howard S.
Cleveland Hghts.	Rosenman, Leonard
Columbus	Powell, Bradford
Edson	Willoughby, Dayton W.
McConnelsville	Gaylord, Paul R.
Massilon	Manbeck, Frank E.
Wilberforce	Heard, Squire W.
Youngstown	Bloch, Bernard

Oklahoma

McAlester	Miller, John A.

Oregon

Portland	Dietz, William C.

Panama Canal Zone

Pedro Miguel	Clinchard, William H., Jr.

Pennsylvania

Aldan	McCormick, Willis J.
Artistes	Kostenbauder, William L.
Devon	Dengler, Louis C.
Philadelphia	Rossi, Anthony J.
Pittsburgh	Metz, Harry C., Jr.
West Hazleton	Harper, Frank T.

Rhode Island

Providence	Kiernan, Martin L., Jr.
Providence	Sannella, Francis M.

South Dakota

Mobridge	Bootz, William C.

Tennessee

Nashville	Martin, Richard E., Jr.
Nashville	Sullivan, Richard H.
Jackson	Pearson, Welton D.

Texas

Austin	Gillespie, Carroll C., Jr.
Canton	Mitchell, Jack A.
Dallas	Givler, Robert W.
Electra	Green, Paul M.
Fredericksburg	Schmulen, James A., Jr.
Gainesville	Lancaster, James E.
Houston	McGuffey, Llewellyn S.
Houston	Montgomery, Thomas J.
Houston	Odom, Ivey B.
Kingsville	Whaley, Raymond W.
Mt. Pleasant	Witt, James H.
Munday	Harber, James F.
Royce City	Ellis, Richard M., Jr.
San Antonio	Cummins, Light T.

Utah

Salt Lake City	Hair, Vee B.
Salt Lake City	McKean, Jack R.

Vermont

Franklin	Snipes, William E., Jr.

Virginia

Emporia	Harris, Hubert B., Jr.
Petersburg	Logan, William M.
Richmond	Bear, Samuel E.

Washington

Kelso	Pepin, Bernard M.
Seattle	Nelson, Richard L.
Vancouver	Lieser, Miles R.
Yakima	Doran, Arthur S.

West Virginia

Huntington	Preston, Hubert, Jr.
Williamson	Sheldon, Morris R.

Wisconsin

Algoma	Hruska, Harvey J.
Appleton	Fetting, Earl A.
Ashland	Nolan, Willard E.
Clear Lake	Peterson, John A.
DeForest	Bakke, Knight J.
Eau Claire	Radke, Frederick W.
Fond du Lac	Schultz, William E.
LaCrosse	Marshall, Harry J., Jr.
Madison	Peshak, Emanuel J.

DEATHS

Aiken, H. L., Orchard, Neb.; Western Dental College, 1904; died November 17; aged 72.

Allen, Charles E., Chicago; Chicago College of Dental Surgery, Dental Department of Loyola University, 1906; died December 7; aged 56.

Barlow, Virgil O., Shreveport, La.; Atlanta-Southern Dental College, 1913; died December 4; aged 53.

Bay, Roy, Sedalia, Mo.; Washington University School of Dentistry, 1899; died in November.

Beckman, Arthur R., Dallas, Texas; State Dental College, 1918; died November 28; aged 51.

Betts, Allan R., Newark, N. J.; Baltimore College of Dental Surgery of the University of Maryland, 1923; died December 8; aged 48.

Binder, Hyman, Long Island City, N. Y.; died November 21; aged 41.

Bollinger, Jacob, Nanuet, N. Y.; College of Dental and Oral Surgery of New York, 1906; died December 13; aged 67.

Brock, Arlett J., Portland, Ore.; North Pacific College of Oregon School of Dentistry, 1904; died December 14; aged 70.

Brodie, John G., Niles, Mich.; University of Michigan College of Dental Surgery, 1917; died November 5.

Buell, Edgar B., Escondido, Calif.; University of Southern California College of Dentistry, 1901; died November 16; aged 77.

Burns, E. V., Leipsic, Ohio; Ohio College of Dental Surgery, Dental Department of the University of Cincinnati, 1903; died November 14; aged 66.

Crawford, Harold V., Golden, Colo.; University of Denver School of Dentistry, 1917; died November 13; aged 57.

Crook, George T., Beachwood, N. J.; died November 13; aged 90.

Daley, Michael J., Pittston, Pa.; School of Dentistry, Temple University, 1924; died November 11.

DeGroot, Hugh I., Woodmere, N. Y.; Philadelphia Dental College, 1902; died December 9; aged 77.

Duncan, John K., Washington, D. C.; School of Dentistry, Georgetown University, 1906; died December 2; aged 74.

Eberhart, John F., Cleveland; College of Dentistry, Ohio Medical University, 1897; died November 19; aged 68.

Elwell, Dwight A., Toledo, Ohio; Indiana Dental College, 1892; died November 24; aged 77.

Endelman, Julio, Los Angeles; School of Dentistry, University of Pennsylvania, 1900; died November 10; aged 69.

Espey, Eugene S., Rising Sun, Ind.; Louisville College of Dentistry of Centre College, 1896; died December 4; aged 76.

Federman, Albert G., Chester, Pa.; School of Dentistry, University of Pennsylvania, 1917; died October 21; aged 53.

Ferguson, James W., Marion, Ill.; School of Dentistry, Washington University, 1913; died December 11; aged 56.

Freeman, Jacob, Philadelphia; Medico-Chirurgical College of Philadelphia, 1912; died November 19; aged 65.

Gunther, Frank E., Chicago; American College of Dental Surgery, 1895; died December 7; aged 75.

Guthrie, George N., Nashville, Tenn.; School of Dentistry, Vanderbilt University, 1901; died October 24; aged 68.

Haller, William E., Denver; College of Dental Surgery, University of Michigan, 1902; died November 27; aged 69.

Handshaw, Carl G., Centerville, Mich.; College of Dental Surgery, University of Michigan, 1917; died November 6; aged 54.

Harris, Charles H., Sturgeon, Mo.; died November 4; aged 74.

Harrison, H. W., Sr., Anderson, Ind.; Pennsylvania College of Dental Surgery, 1893; died December 10; aged 76.

Heck, Trosseau P., Muncie, Ind.; Indiana Dental College, 1916; died December 3; aged 54.

Houck, E. P., Portland, Ind.; Cincinnati College of Dental Surgery, 1899; died December 4.

Hulick, William O., Cincinnati; Ohio College of Dental Surgery, University of Cincinnati, 1889; died November 29; aged 83.

Jenne, Frank L., Gloversville, N. Y.; School of Dentistry, University of Buffalo, 1901; died October 31; aged 69.

Jensen, Ole J., Santa Barbara, Calif.; Dental School, Northwestern University, 1905; died November 19; aged 74.

Jones, Carl, Boscobel, Wis.; Dental School, Northwestern University, 1901; died December 7; aged 67.

Jordan, Vane A., Seattle; Dental School, Northwestern University, 1903; died November 19; aged 69.

Justin, Jorgen P., Milwaukee; Dental School, Marquette University, 1922; died November 19; aged 53.

Karcher, William H., Champaign, Ill.; College of Dentistry, University of Illinois, 1903; died November 30; aged 77.

King, Peter V., Petersburg, Va.; died November 4; aged 71.

King, Quincy B., Washington, D. C.; College of Dentistry, Howard University, 1913; died December 2; aged 69.

Lacey, Glenn D., Dallas, Texas; College of Dentistry, University of Minnesota, 1916; died November 10; aged 54.

Lieberman, Fred P., Phillipsburg, N. J.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1907; died November 3; aged 64.

Lindaas, Martin R., Chicago; Chicago College of Dental Surgery, Dental Department of Loyola University, 1914; died November 14; aged 63.

Lyons, J. Kenneth, Jackson, Mich.; College of Dental Surgery, University of Michigan, 1924; died October 30; aged 46.

McConnell, Elmer C., San Diego, Calif.; died November 3.

McWhirt, Charles H., Wichita, Kan.; died November 16; aged 76.

Marchand, Lawless U., Gonzales, La.; died November 2; aged 63.

Mason, William L., Hawesville, Ky.; Dental Department, Meharry Medical College, 1930; died November 24; aged 44.

Mayo, Newell C., Raymond, N. H.; Tufts College Dental School, 1916; died November 4; aged 59.

Meadors, Joseph T., Nashville, Tenn.; School of Dentistry, Vanderbilt University, 1896; died November 17; aged 73.

Meier, William J., New York; Department of Dental Surgery, Detroit College of Medicine, 1902; died October 8; aged 67.

Miller, James H. A., Alderson, W. Va.; Baltimore College of Dental Surgery of the University of Maryland, 1887; died August 9; aged 88.

Miller, Robert T., Muncie, Ind.; Dental School, Northwestern University, 1903; died November 8; aged 67.

Morey, Ernest W., Stratford, Conn.; School of Dentistry, Temple University, 1909; died December 5; aged 64.

Morgan, Harold C., West Upton, Mass.; Baltimore College of Dental Surgery, 1916; died October 25; aged 59.

Moss, Herbert A., Asheville, N. C.; School of Dentistry, North Pacific College of Oregon, 1905; died September 9; aged 65.

Murff, Clarence Y., Sr., Fort Worth, Texas; State Dental College, 1910; died December 1; aged 72.

Myers, John L., Atlanta, Ga.; Baltimore College of Dental Surgery of the University of Maryland, 1929; died September 26; aged 45.

Myers, Wilson E., Nanticoke, Pa.; Pennsylvania College of Dental Surgery, 1905; died September 20; aged 70.

Needham, John B., Terre Haute, Ind.; School of Dentistry, Indiana University, 1905; died November 2; aged 69.

Nelson, Anton, Ada, Minn.; College of Dentistry, University of Minnesota, 1912; died December 12.

Nicholson, James H., Dallas, Texas; died August 5; aged 69.

O'Connell, Elmer C., San Diego, Calif.; College of Physicians and Surgeons, 1917; died November 3; aged 60.

O'Connor, Edward, Braintree, Mass.; Dental School, Harvard University, 1903; died October 11; aged 77.

O'Donnell, P. X., Hazleton, Pa.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1901; died September 24; aged 81.

O'Flinn, John E., Meridian, Miss.; Atlanta Dental College, 1914; died November 11; aged 55.

Parish, Wesley A., Avon, N. Y.; School of Dentistry, University of Buffalo, 1896; died October 6; aged 75.

Patton, Samuel C., Palestine, Texas; Atlanta Dental College, 1903; died September 4; aged 71.

Paul, Charles E., Columbus, Ohio; College of Dentistry, Ohio State University, 1927; died September 24; aged 45.

Payne, Ralph W., Greenfield, Mass.; died December 3; aged 71.

Peterson, Hugo E., Rawlins, Wyo.; School of Dentistry, University of Denver, 1918; died October 2; aged 53.

Phillips, John T., Livingston, Ala.; College of Dentistry, University of Tennessee, 1895; died November 18; aged 88.

Proctor, William O., Doniphan, Mo.; Dental School, Northwestern University, 1902; died October 16; aged 75.

Race, Loren, Plainview, Minn.; College of Dentistry, University of Minnesota, 1938; died October 10; aged 42.

Raney, Neal C., Laguna Beach, Calif.; College of Dentistry, University of Southern California, 1927; died October 20; aged 48.

Regan, Leo, Potsdam, N. Y.; College of Dental Surgery, University of Michigan, 1911; died October 3; aged 65.

Requa, LeRoy, Rochester, N. Y.; School of Dentistry, University of Pennsylvania, 1889; died September 18; aged 83.

Rhodes, J. G., Fort Pierce, Fla.; Howard University Dental School, 1928; died November 26.

Rink, Isaac C., Paterson, N. J.; Baltimore College of Dental Surgery of the University of Maryland, 1895; died October 28.

Robins, William R., Harlem, Ga.; died November 9.

Rodolph, Frank E., San Francisco; University of California College of Dentistry, 1904; died November 16; aged 69.

Rogers, C. Hammett, Newport, R. I.; School of Dentistry and the Baltimore College of Dental Surgery, University of Maryland, 1904; died October 31; aged 66.

Rosoff, Meyer L., New York; New York College of Dentistry, 1914; died October 6; aged 62.

Ross, Arnett E., San Francisco; Central College of Dentistry, 1898; died September 22; aged 72.

Rounds, Fred L., Brocton, Mass.; Temple University School of Dentistry, 1896; died October 28; aged 74.

Rouse, George D., Charleston, S. C.; Dental Department, Tennessee Medical College, 1892; died November 3; aged 78.

Rudee, Mervyn C., Palo Alto, Calif; College of Dentistry, University of California, 1915; died September 12.

Ryan, Leo C., Las Vegas, Nev.; School of Dentistry, University of Denver, 1919; died October 30; aged 52.

Safirstein, George J., South Orange, N. J.; Dental Department, George Washington University, 1919; died November 21; aged 55.

Sattler, Willis J., Cincinnati; Cincinnati College of Dental Surgery, 1912; died September 27; aged 77.

Sauter, Anton W., Milwaukee; Dental School, Marquette University, 1907; died October 23; aged 63.

Schaller, William H., Milwaukee; Dental School, Marquette University, 1912; died October 7; aged 60.

Schminke, Eberhardt A., North Pelham, N. Y.; College of Dental and Oral Surgery of New York, 1917; died October 12; aged 63.

Scholl, Max, Houston, Texas; died September 16; aged 58.

Schultz, Leonard F., Muskegon, Mich.; died October 27; aged 32.

Schwarz, Hirsch J., St. Louis, Mo.; Dental Department, Barnes Dental College, 1914; died November 7; aged 88.

Sherwood, Charles L., Conneautville, Pa.; Died November 28; aged 83.

Sieber, Edward L., Ft. Wayne, Ind.; Dental School, Northwestern University, 1912; died November 1; aged 68.

Sivula, John F., Munising, Mich.; College of Dental Surgery, University of Michigan, 1925; died September 22; aged 46.

Skinner, Guy B., Wilmette, Ill.; Chicago College of Dental Surgery, 1918; died August 24; aged 54.

Smith, Ernest C., Bainbridge, Ga.; died October 27; aged 78.

Smith, Eldon J., Taylor, Wis.; Northwestern University Dental School, 1917; died November 13; aged 57.

Smith, J. Yates, Charlottesville, Va.; died October 24; aged 66.

Smith, Raymond M., East Greenwich, R. I.; Tufts College Dental School, 1908; died November 15.

Smith, William M., New Delhi, India; died October 7.

Snow, Wallace, West Barstable, Mass.; Harvard University Dental School, 1916; died October 22.

Sparks, Edward F. K., Los Angeles; died November 29; aged 73.

Spencer, James F., Marlboro, Mass.; Medico-Chirurgical College of Philadelphia, 1900; died November 11; aged 72.

Sperry, Edward B., Kansas City, Mo.; Kansas City Dental College, 1904; died October 17; aged 65.

Stark, Henry, Detroit; College of Dental Surgery, University of Michigan, 1918; died October 6; aged 54.

Stephan, John F., Cleveland, Ohio; Chicago College of Dental Surgery, 1892; died November 10; aged 76.

Stukey, Mirl H., Columbus, Ohio; Department of Dentistry, Starling-Ohio Medical College, 1909; died September 12; aged 60.

Sweer, John H., Pittsburgh; died October 9; aged 76.

Tavlin, Randall C., Fort Lauderdale, Fla.; College of Dentistry, University of Minnesota, 1935; died October 24; aged 38.

Taylor, B. N., Louisville, Ky.; Department of Dentistry, Hospital College of Medicine of Central University, 1914; died September 29; aged 58.

Taylor, George F., Madrid, Spain; died October 29; aged 76.

Taylor, Walter G., Hollywood, Calif.; died September 30; aged 54.

Temple, Robert M., Columbus, Ohio; Ohio Medical University College of Dentistry, 1905; died November 10; aged 69.

Tomlin, Francis H., Haddonfield, N. J.; Philadelphia Dental College, 1899; died October 13; aged 69.

Turner, Joseph H., North Little Rock, Ark.; Vanderbilt University School of Dentistry, 1913; died November 10.

Tyler, John L., Tunkhannock, Pa.; died October 27; aged 74.

Vertullo, George, Pittsburgh; School of Dentistry, University of Pittsburgh, 1930; died October 31; aged 44.

Vinberg, Joseph T., Medford, Mass.; College of Dentistry, Ohio State University, 1916; died October 19; aged 59.

Voorhees, Perry, Los Angeles; died October 21; aged 61.

Wagner, William J. A., Sherman, N. Y.; College of Dental Surgery, University of Michigan, 1908; died September 15; aged 73.

Walker, Alfred, Miami Beach, Fla.; New York College of Dentistry, 1897; died October 15; aged 72.

Walther, Arthur W., Chicago; died November 4; aged 62.

Walton, Roy P., La Junta, Colo.; Colorado College of Dental Surgery, 1906; died September 30; aged 67.

Weir, Francis S., Portland, Ore.; North Pacific College of Oregon School of Dentistry, 1917; died November 20; aged 60.

Weir, George E., Indianapolis; Indiana Dental College, 1909; died October 6; aged

Wells, William A., Butte, Mont.; died August 7; aged 58.

Westall, Orville D., Aberdeen, S. D.; died October 21; aged 68.

Westland, George, Kindred, N. D.; died November 17.

Weston, Raymond B., Albany, N. Y.; School of Dentistry, University of Buffalo, 1912; died October 22; aged 58.

Whitright, Samuel L., Waterbury, Conn.; died September 27; aged 72.

Willson, Barrett P., Rockville, Md.; School of Dental and Oral Surgery, Columbia University, 1904; died September 27; aged 68.

Wing, George W., Ontario, Canada; College of Dentistry, Ohio Medical University, 1903; died September 6; aged 76.

Woods, Frank E., Covington, Va.; Baltimore College of Dental Surgery of the University of Maryland, 1916; died November 27; aged 57.

Wright, Arter B., Dickson, Tenn.; died September 18; aged 68.

Wright, Walter L., Dayton, Ohio; Cincinnati College of Dental Surgery, 1899; died November 13; aged 73.

Wulfman, Armin E., Huntington, W. Va.; Ohio College of Dental Surgery, University of Cincinnati, 1909; died September 5; aged 63.

Wyman, Harry P., Philadelphia; died September 5.

Yates, J. S., Charlottesville, Va.; Dental Department, University College of Medicine, 1905; died October 24; aged 66.

Ziskin, Daniel E., New York; College of Dentistry, University of Minnesota, 1917; died October 21; aged 53.

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ANNOUNCEMENTS

MEETINGS OF STATE SOCIETIES

State	Date	Place	Secretary	Address
Alabama	May 2-4	Biloxi	G. W. Matthews	1922 Tenth Ave., S., Birmingham 5
Arizona			H. G. DeWolf	Valley National Bank Bldg., Tucson
Arkansas	April 24-27	Little Rock	D. M. Hamm	White Bldg., Clarksville
California			L. E. Linehan	450 Sutter St., San Francisco
S. California	April 4-6	Los Angeles	M. E. Ralston	Medico-Dental Bldg., Pomona
Colorado	May 25-27	Colorado Springs	R. A. Downs	724 Republic Bldg., Denver 2
Connecticut			E. S. Arnold	37 Linnard Rd., W. Hartford
Delaware			G. Zurkow	301 Medical Arts Bldg., Wilmington 9
D. of Columbia			K. H. Wood	202-1835 Eye St., N.W., Washington
Florida			L. M. Schulstad	Professional Bldg., Bradenton
Georgia			J. M. Heard, Jr.	Persons Bldg., Macon
Hawaii			J. H. Dawe	P. O. Box 39, Honolulu 10
Idaho			H. R. Packard	Idaho Falls
Illinois	May 9-12	Peoria	P. W. Clopper	623 Jefferson Bldg., Peoria 2
Indiana	May 16-18	Indianapolis	E. E. Ewbank	Kingman
Iowa	May 2-4	Des Moines	H. I. Wilson	639 Insurance Exchange, Des Moines
Kansas	May 22-25	Topeka	F. A. Richmond	1008 Huron Bldg., Kansas City
Kentucky	April 3-6	Louisville	A. B. Coxwell	1976 Douglass Blvd., Louisville
Louisiana	June 1-4	New Orleans	J. S. Bernhard	407 Medical Arts Bldg., Shreveport
Maine			P. W. Anderson	32 Deering St., Portland 3
Maryland	May 2-4	Baltimore	E. L. Pessagno, Jr.	415 Medical Arts Bldg., Baltimore 1
Massachusetts	May 2-5	Boston	P. E. Adams	106 Marlborough St., Boston
Michigan	April 11-13	Detroit	F. Wertheimer	Michigan Department of Health, Lansing
Minnesota	Feb. 21-23	Minneapolis	C. V. E. Cassel	242 Lowry Medical Arts Bldg., St. Paul
Mississippi	April 10-13	Vicksburg	F. C. Sneed	Osyka
Missouri	April 10-13	St. Louis	D. E. Hooper	K. P. Bldg., Boonville
Montana	May 5-7	Bozeman	C. S. Renouard	304 Phoenix Bldg., Butte
Nebraska	May 9-11	Lincoln	F. A. Pierson	Federal Securities Bldg., Lincoln
Nevada	June 3-4	Reno	L. G. Jacob	505 Chestnut St., Reno
New Hampshire			F. E. Williams	814 Elm St., Manchester
New Jersey	April 26-29	Atlantic City	J. G. Carr	407 Copper St., Camden
New Mexico			J. S. Eilar	First National Bank Bldg., Albuquerque
New York	May 10-13	Buffalo	C. A. Wilkie	1 Hanson Place, Brooklyn
North Carolina	May 19-21	Pinehurst	R. F. Hunt	Rose Drug Co. Bldg., Rocky Mount
North Dakota	May 8-11	Bismarck	A. L. Smeby	Northwood
Ohio	Nov. 7-10	Columbus	E. G. Jones	185 E. State St., Columbus
Oklahoma	April 10-13	Oklahoma City	E. H. Binkley	Hennessey
Oregon	Feb. 28-Mar. 2	Portland	W. H. Hurley	722 Selling Bldg., Portland 5
Panama Canal Zone			R. O. Leon	Box 1094, Ancon
Pennsylvania	June 1-3	Pittsburgh	J. Wittek	217 State St., Harrisburg
Puerto Rico			E. Capo	9 Villa St., Ponce
Rhode Island			A. A. Albert	84 Broad St., Pawtucket
South Carolina	May 1-3	Myrtle Beach	J. R. Owings	201 E. North St., Greenville
South Dakota	May 15-17	Aberdeen	E. W. Elmen	Sioux Falls
Tennessee	May 16-19	Knoxville	E. J. Justis	Exchange Bldg., Memphis
Texas	May 2-5	Houston	W. Ogle	313 Medical Arts Bldg., Dallas
Utah			H. R. Nordberg	807 Tribune-Telegram Bldg., Salt Lake City
Vermont	May 22-24	Woodstock	J. A. Larrow	Middlebury
Virginia	April 11-13	Roanoke	J. E. John	804 Medical Arts Bldg., Roanoke
Washington	June 20-22	Seattle	F. J. Dingler	1502 Medical-Dental Bldg., Seattle 1
West Virginia	May 19-21	Wheeling	C. J. Gavelda	Clarksburg
Wisconsin	April 19-21	Milwaukee	R. A. Mason	964 N. 27th St., Milwaukee 2
Wyoming			T. A. Ward	Casper

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

State	Date	Place	Secretary	Address
Arkansas	June 20-23	Little Rock	H. E. Hanna	Wilson Building, El Dorado
California	Feb. 7 June 13 July 25	San Francisco Los Angeles San Francisco	K. I. Nesbitt	Room 307, 507 Polk Street, San Francisco 2
Iowa	May 30-June 3	Iowa City	H. M. Willits	719 Roshek Bldg., Dubuque
Michigan	Feb. 7-12 May 23-28	Ann Arbor Ann Arbor	J. L. Champagne	502 David Whitney Bldg., Detroit 26
New Jersey	June 6-10		W. A. Wilson	150 E. State St., Trenton
North Carolina	June 27-30	Raleigh	F. O. Alford	Charlotte
West Virginia	June 27-29	West Liberty	R. H. Davis	510-16 Goff Bldg., Clarksburg
Wisconsin	Feb. 7-11	Milwaukee	S. F. Donovan	Tomah

OTHER MEETINGS

Name	Date	City	Secy. or Chmn.	Address
Academy of Denture Prosthetics	June 13-18	Indianapolis	I. L. Furnas Secy.	928 Silverado St., La Jolla, Calif.
American Academy of Cleft Palate Prosthesis	Mar. 21-22	Columbus	V. L. Steffel Dir. of Pub.	19 W. Fifth Ave., Columbus
American Academy of Oral Pathology, Annual Meeting	Feb. 6	Chicago	H. L. Bevis Pres.	Ohio State University, Columbus 10
American Association of Endodontists	Feb. 5-6	Chicago	N. W. Burkman Secy.	525 Merrill St., Birmingham, Ala.
American Board of Orthodontics	April 28-May 1	New York	S. C. Hopkins Secy.	1726 Eye St., N.W., Washington 6, D.C.
American Dental Association, Ninetieth Annual Meeting	Oct. 17-21	San Francisco	H. Hillenbrand Secy.	222 E. Superior St., Chicago 11
American Dental Hygienists' Association, Twenty-Sixth Annual Meeting	Oct. 17-21	San Francisco	A. Rebekah Fisk Secy.	1830 Eye St., N.W., Washington, D.C.
American Dental Society of Europe	Aug. 3-6	Paris	F. D. Derrick Secy.	140 Park Lane, London, W. 1
American Public Health Association, Seventy-Seventh Annual Meeting	Oct. 23	New York	R. M. Atwater Secy.	1790 Broadway, New York 19
American Society for the Advancement of General Anesthesia in Dentistry	Mar. 28	New York	M. H. Feldman Secy.	730 Fifth Ave., New York
Canadian Dental Association, Annual Convention	June 6-8	Saskatoon	D. W. Gullett Secy.	211 Huron St., Toronto
Chicago Dental Society, Mid-Winter Meeting	Feb. 7-10	Chicago	A. L. Brett Secy.	30 N. Michigan Ave., Chicago
Cincinnati Dental Society, March Clinic and Children's Dental Health Day	Mar. 20-22	Cincinnati	R. L. Holle Chm. Pub. Comm.	Doctors Bldg., Cincinnati 2
Cleveland Dental Society, Ninth Annual Children's Dental Health Day	Feb. 7	Cleveland	H. Alexander Chm.	13929 Euclid Ave., Cleveland
District of Columbia, Annual Postgraduate Clinic	Mar. 13-16	Washington	S. G. Mead Secy.	1149 16th St., N.W., Washington
Federacao Odontologica Brasileiro, Fourth Congresso	July	Recife, Brazil	R. Ewerton	277 Avenida Rio Branco, Rio de Janeiro
Greater Philadelphia Annual Meeting	Feb. 2-4	Philadelphia	R. Adams Secy.	501 Stock Exchange Bldg., Philadelphia 2
Mid-Atlantic States Seminar in Oral Medicine	May 22-27	Pocono Mountains	L. W. Burket Dir. Postgraduate Divn.	4001 Spruce St., Philadelphia
Ontario Dental Association, Eighty-Second Annual Convention	May 16-18	Toronto	Dorothy Jutton Secy.	86 Bloor St., West Toronto 5
Seventh Pacific Science Congress	Feb. 2-8 Feb. 16-22	Auckland, N.Z. Christchurch, N.Z.	G. Archey Secy.	Seventh Pacific Science Cong., Auckland Institute & Museum, Box 27, Newmarket, Auckland, S.E. 1, New Zealand
Temple Alumni, Annual Gathering	April 27-28	Philadelphia	A. L. Borish	1210 Medical Tower, Philadelphia 3

Thomas P. Hinman Mid-Winter Clinic, Thirty-Sixth Annual Meeting	Mar. 20-23	Atlanta	J. A. Broach Chmn.	1105 Doctors Bldg., Atlanta, Ga.
University of Kansas City, School of Dentistry, Kansas City-Western Dental College, Alumni Association, Annual Dinner	Mar. 21-22	Kansas City	C. W. Sawyer Secy.	1108 E. Tenth St., Kansas City 6
University of Pennsylvania, Dental Alumni Society	Feb. 1	Philadelphia	J. P. Looby Chm. Pub. Comm.	Thomas W. Evans Museum and Dental Institute, School of Dentistry, University of Pennsylvania, Philadelphia 4
Washington University, Dental Alumni Annual Meeting	Mar. 18-19	St. Louis	V. P. Thompson Secy-Treas.	234 W. Lockwood Ave., Webster Groves, Mo.